The Electrical Industry's Weekly Magazine

September 4, 1961

Electrical World

Price 50 Cents

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4-Step Capacitor Switching Improves Circuit Voltage

...p 46

UNIV MICROFILMS INC
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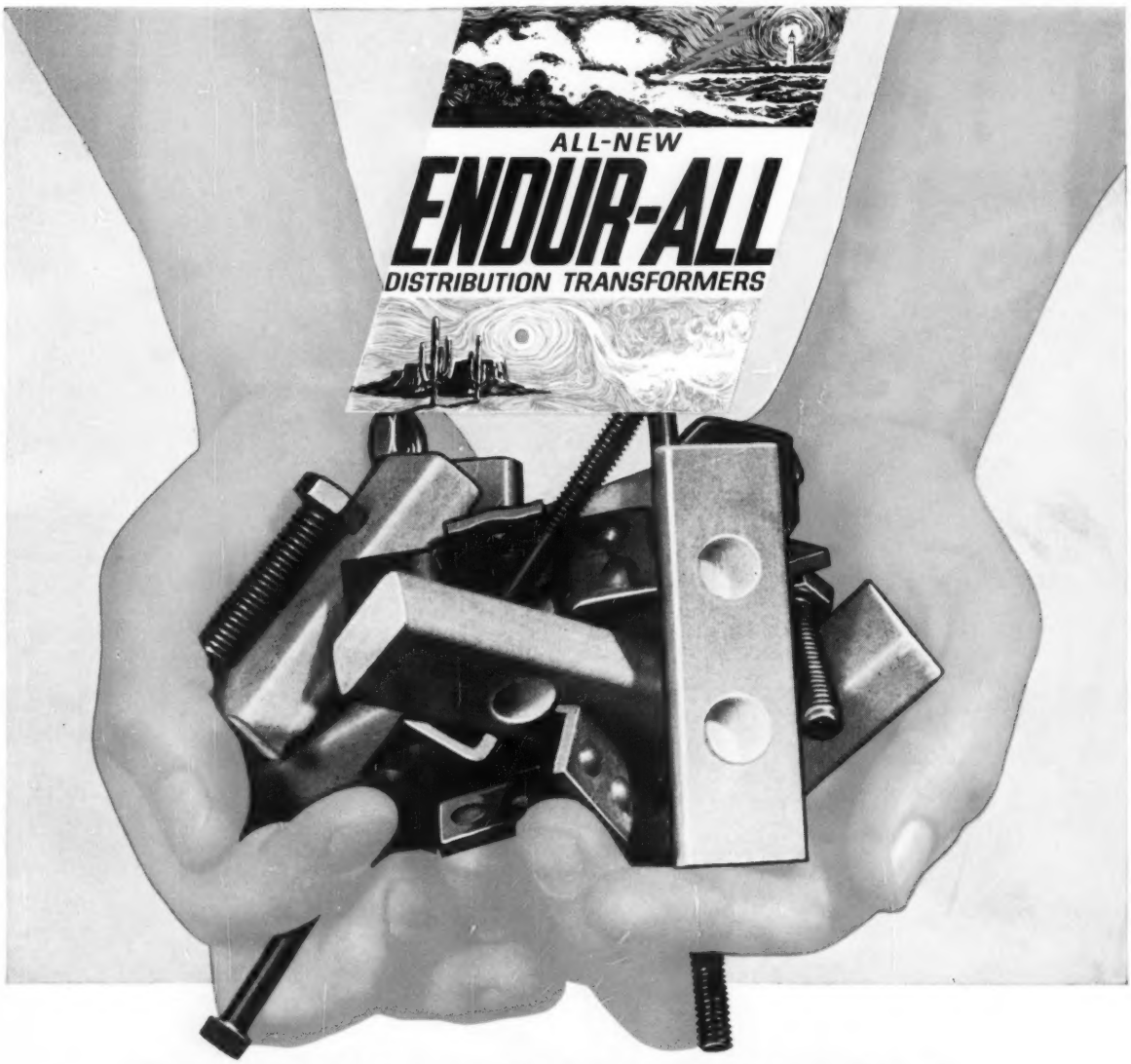

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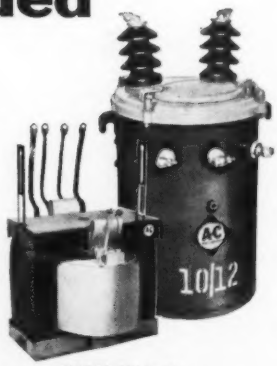

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Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

September 4, 1961
Vol. 156, No. 10

Dateline . . .

Japan—Possible Opportunity for US Investors

Tokyo—Will Japan's electrical utility industry provide an investment opportunity for foreigners? Depending a great deal on who he talked with last, an inquiring person usually gets the impression that the answer is "yes," and probably within the next two years.

Japan's equivalent of the Edison Electric Institute is a group called the Electric Power Survey Committee. Its prognostication is that demand for electricity will increase 12% a year to reach 131.3 billion kwhr by 1964. If the prediction is within shooting distance of accuracy, this means that the nine investor-owned utilities will have to start to raise about $5-billion—total capital. Even for a nation that has demonstrated its ability to expand industries of all kinds, including electric utilities, at an overwhelming pace, this is an imposing amount of money.

There is no reason to doubt the Power Survey Committee figures. Demand for electricity has increased one-third since 1958. This is a matter of record. The committee thinks 1964 will see a doubling of 1958 demand.

Until this year, demand and capability have broken even, but now there is a 0.3% deficiency and the committee expects this to increase to 13.6% by 1964. This estimate is based on construction schedules and planned expansions as of Oct. 1, 1960.

So far, Japan has been able to turn to the Export-Import Bank for money for equipment and engineering services, and to its own investors for other money it has needed. In fact, going to the home folks for capital has been a rather jealously protected tradition, and if the continuing tremendous rate of demand increase alters this practice, there will be some important emotional as well as practical changes to be made.

And the Export-Import Bank supply of money is not unlimited. To date, the utility industry has not been given a priority for borrowing by the Japanese government, so it must compete for Export-Import Bank funds with other booming industries. This is another factor that leads to speculation that other capital sources must be found.

Toronto's *Financial Post* carried an estimate that 50% of the $5-billion will have to come from outside Japan. Assuming that some of this will be put up by the Export-Import Bank, there is still a sizable amount to be raised from other sources.

How would US investors rate as potential sources?

(*Continued on page 5*)

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Detailed engineering and application data are included in our handbook No. PSG-559. Write Unit Substation Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

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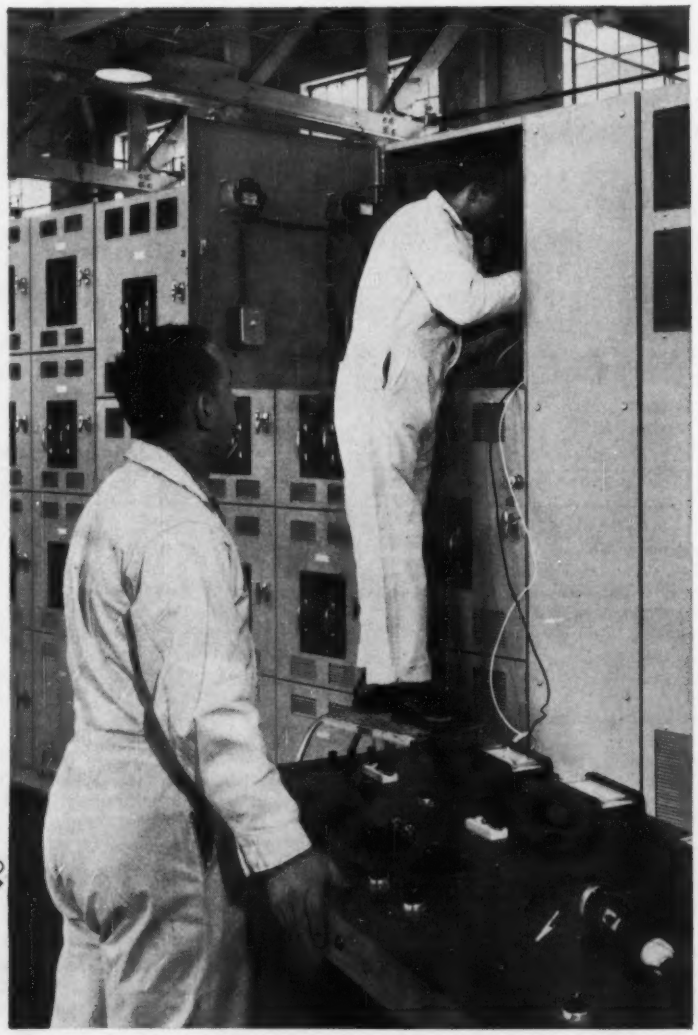

Dateline . . .

Tokyo (*Continued from page* 3)

Will they have first call? Second call? No call?

Here is where the emotional aspects of breaking with tradition might give US investors a slight jump on other potential sources of capital—especially since it is the electrical industry that needs the money. Japan has experience, now, with compatible working agreements between Japanese and US electrical manufacturers. Both Hitachi and Toshiba (the General Electric and Westinghouse of Japan, figuratively speaking) have reciprocal agreements with General Electric, and Mitsubishi has a similar lash-up with Westinghouse.

Besides this, the investor-owned utilities themselves have turned toward US-built equipment because their own manufacturers do not produce units of the sizes that are needed to meet leap-frogging electrical demand. So, they have US equipment on the line and have placed orders for more. They have had favorable experience with US business dealings. If nothing else, this could be a factor in easing some of the understandable uncertainties the utilities might feel if they have to offer stocks and bonds to foreign investors. Past experience in these other things could contribute to a feeling of security as the utilities break with tradition in meeting their capital needs.

Whether US investors would be interested or not is wide open for speculation. It would seem that there would have to be some Japanese government guarantee of dollar remittances of interest and dividends, at least, and maybe assurances of other kinds, too.

But Japan's electrical industry itself, with its mushrooming characteristics, and with no end of the growth yet in sight, would appear to be attractive to any investor. And the experience of General Electric and Westinghouse in dealing with Japanese firms would probably help give a feeling of stability and security in this direction, too.

Letters

Clarifies Record of Ac Development

To the Editor:

May I call your attention to an incorrect statement in the Editorial Comment of the July 31 *Electrical World*. Referring to Con Edison you state that "Its development of the low-voltage network, for instance, dates back to the early Twenties."

Insofar as I can determine, the first low-voltage ac network was installed in Memphis about 1907. Its solid grid of low-voltage mains was supplied by primary feeders through primary cutouts and transformer banks that were connected to the grid through fuses.

New York City had a low-voltage ac network with network protectors in 1914, cf AIEE Transactions, Vol. 33: "The 'network protector' consists of a small transformer having the same ratio as the main transformer. The primary and secondary leads of the main transformer are carried through the protector in series. In case of a defect in the transformer the fuses of the protector quickly open the connections to the network and thus prevent the current from blowing the fuses of other transformers."

Needless to say, no ac network protected by fuses was satisfactory. This statement does not apply to "limiters" widely used today.

The first ac network with automatic reclosing network protectors was placed in operation in New York about 1922.

John C. Parker, Professional Engineer
Memphis, Tenn.

►We appreciate reader Parker's reminder that fused secondary networks antedated the automatic type with reclosing protectors. Obviously our editorial referred to the latter, which has won almost universal acceptance.

This is your column in Electrical World. Address your comments, questions, or criticisms to the Letters Editor, Electrical World, 330 West 42nd St, New York 36, N. Y.

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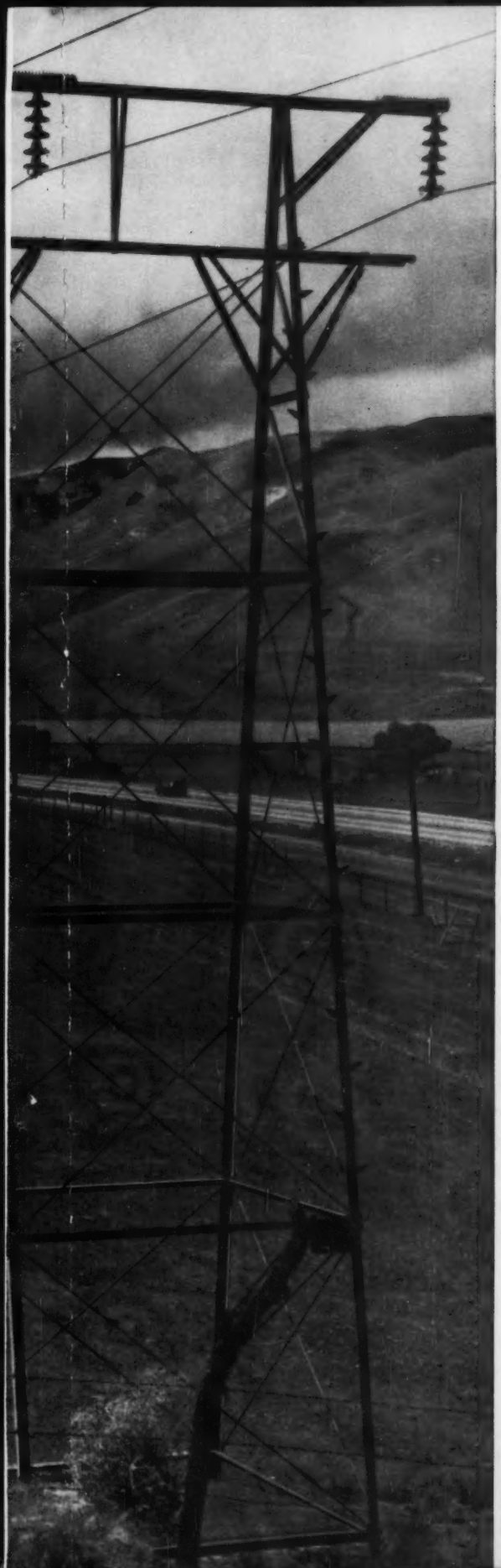

This mark tells you a product is made of modern, dependable Steel.

No maintenance in 56 years

This tower is one of hundreds in the Kern River Transmission Line that has not needed any maintenance since the line was erected in 1905. It was originally built to carry power from the Kern River Power Plant of Southern California Edison Company to Los Angeles, a distance of over 100 miles. In all that time no maintenance has been needed on the steelwork of the tower, although its insulators were changed and concrete footings were placed around the steel below ground surface. The towers are constructed of 4″ x 4″ x 5/16″ carbon steel angles, hot-dip galvanized for corrosion protection. These angles were rolled by Carnegie Steel Company, now part of United States Steel Corporation.

Nothing is as economical as steel. Only steel gives lower first cost plus long-term economy. Steel structures are easy to erect and go years without maintenance. Design with steel for proven dependability and years of satisfactory service. For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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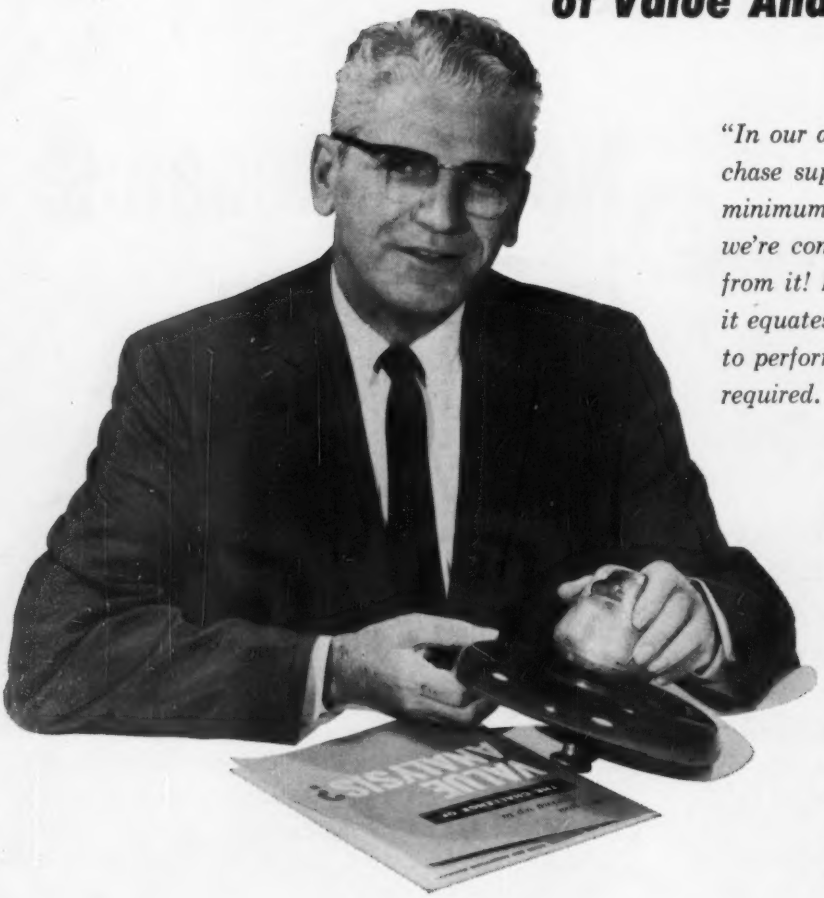
In PURCHASING
Lapp Hi-F meets the challenge of Value Analysis



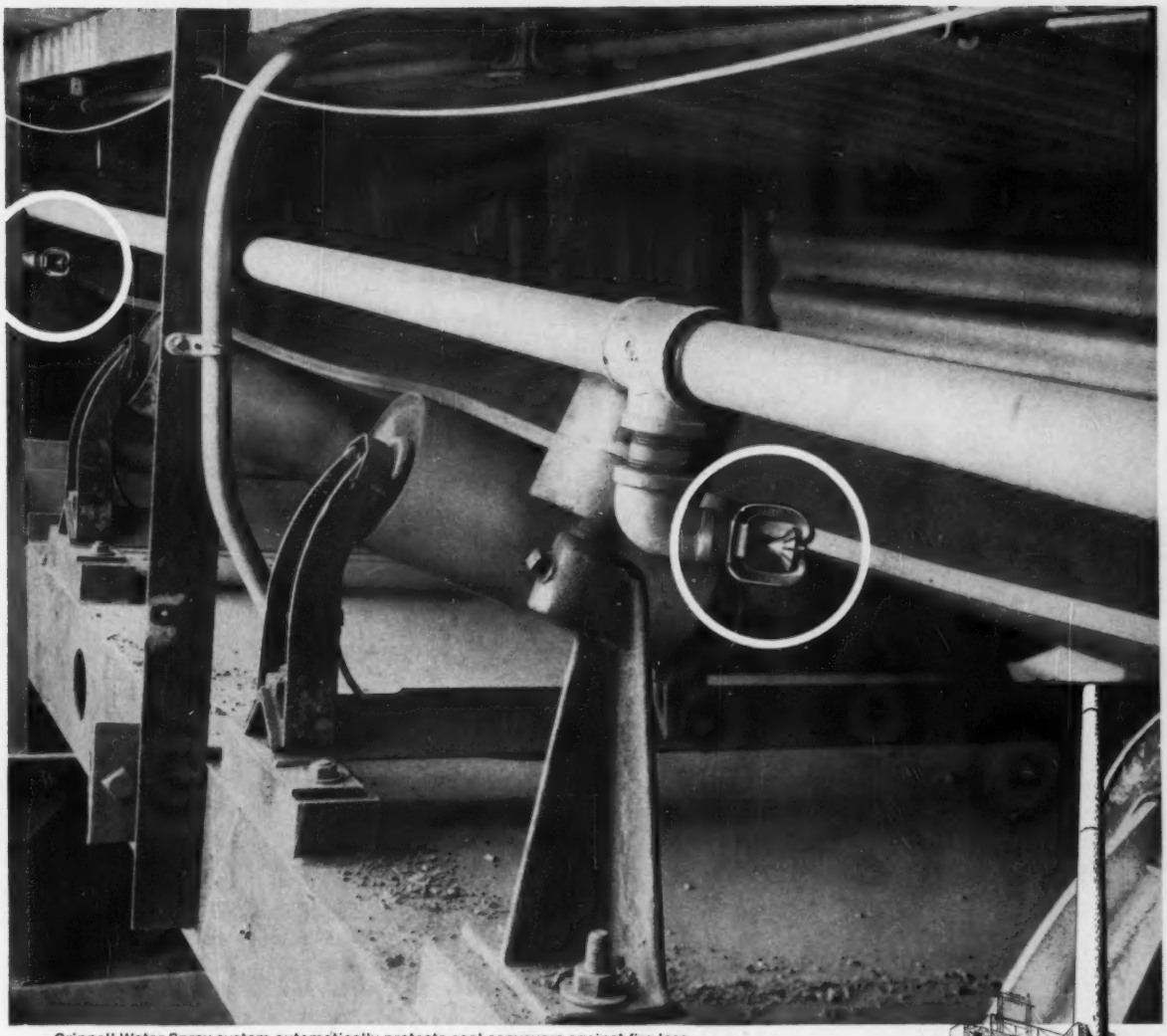
"In our department, our job is to purchase supplies and equipment at true minimum cost. This doesn't mean that we're concerned alone with price. Far from it! Price does count, but only as it equates to the ability of the product to perform the function for which it is required.

"We apparently have been buying suspension insulators for a long time which far exceed in their performance values the engineering requirements of our system—paying for characteristics we don't need, and can't use. The new Lapp **Hi-F** *suspension meets the requirements of almost all of our transmission system—and saves us important money. We're glad to see this break with tradition."*

Lapp **Hi-F** is a suspension insulator 9" in diameter with an M&E strength rating of 14,000 lbs. In all other mechanical ratings, and in all electrical characteristics, it matches the EEI-NEMA 52-3 15,000-lb. "standard 10-inch" unit. It is physically interchangeable with "standard" suspension insulators. Weighs one-third less, costs less to handle in the field, is easier to work with hot-line tools.

We hope you'll take a new look and a long look at your transmission line costs—and efficiency. We think you'll agree that Lapp **Hi-F** makes good sense from all viewpoints—purchasing, engineering, operating and construction.

Lapp Insulator Co., Inc., LeRoy, N. Y.



Grinnell Water Spray system automatically protects coal conveyors against fire loss

Grinnell Water Spray System protects power station coal conveyors against destruction by fire

Fire in a power station's coal conveyors can be serious. So much can be lost — coal, conveyors, other valuable equipment — and *generating capacity*.

That's why the new coal conveyors at American Electric Power Company's 500,000 kw Philip Sporn Station, Unit No. 5, at New Haven, West Virginia, are protected against fire—*automatically*—with a Grinnell Water Spray system!

Grinnell Water Spray system stops fire fast

When fire starts, a Grinnell Water Spray system goes into action *fast*. A spray of water drenches the area, quickly controlling the fire. Result: coal, equipment – and time – saved.

You can protect *your* station against shut-down by fire the same way. Remember, you benefit from 90 years of fire protection experience when Grinnell designs and installs your system.

Free Fire Protection Manual. Grinnell's 40-page manual—"Special Hazard Fire Protection"—gives a comprehensive study of the most advanced special hazard fire protection methods. To get your free copy, write Grinnell Company, Inc., Providence 1, R. I. Branches in principal cities.

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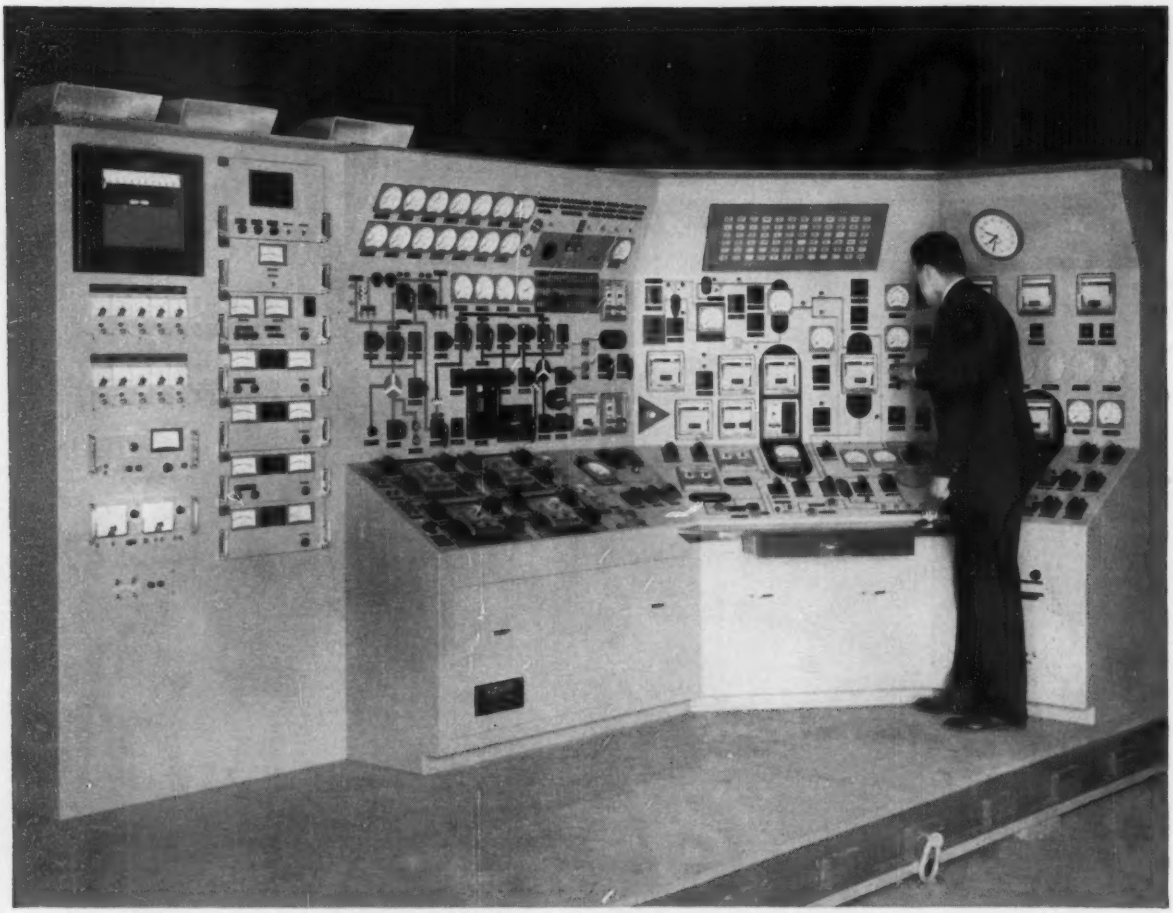
FIRE PROTECTION SYSTEMS SINCE 1870



FOXBORO Electronic Consotrol Control Panel for portable nuclear power plant is designed for one-man operation.

reactor control – plant control – radiation monitoring... they're all on this compact Foxboro Electronic Control Panel

SKID-MOUNTED Foxboro Consotrol panel, enclosed in a protective housing, will be "air-lifted" to its Air Force site, 6500 ft. up in the Wyoming mountains.

One skid — that's all the room allowed for control instrumentation on The Martin Company's PM-1 portable nuclear power plant.

The plant — being built for the Air Force under contract to the AEC — will produce both 1000 kilowatts of electrical power and 7 million btu per hour heat for a remote Air Force station high in the Wyoming mountains.

For the PM-1 Reactor, dependable Foxboro Electronic Consotrol* instruments were specified. 100% solid state — no vacuum tubes to replace — instantaneous response. And they're so compact that both nuclear and process control, as well as radiation monitoring, are included on the same operating console.

Compactness — reliability — proven performance — Foxboro Electronic Consotrols are ideal for both nuclear and conventional power plant control systems. Ask your Foxboro Field Engineer to show you the reasons why. Or write for Bulletin 1-17. The Foxboro Company, 249 Norfolk St., Foxboro, Massachusetts.

Reg. U.S. Pat. Off.

FOXBORO

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Joint Compounds

D. W. Sawyer
Research Engineer
Alcoa Research Laboratories
New Kensington, Pa.

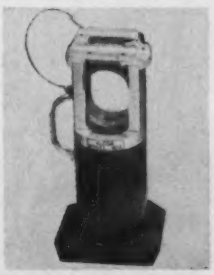
Electrical joint compounds for aluminum-to-aluminum or aluminum-to-copper conductor connections have a dual function. First, they must assist in forming a low resistance joint; they must also exclude corrosion-creating elements which would tend to deteriorate the connection. To effectively exclude moisture, the compound must have properties including long life, stability, wide temperature range without melting or excessive stiffness, resistance to erosion by weather exposure, and workability for ease of application.

To test resistance to erosion by water impingement, Alcoa developed a laboratory apparatus which releases a stream of water drops from a height of 12 inches above test panels placed at 45° angles to the impinging drops. These test panels are coated with a $\frac{1}{64}$-inch film of the compounds being tested. The streams run at a controlled rate of 260 drops per minute. Eight sets of duplicate samples may be tested simultaneously.

This test reveals spectacular differences in the effectiveness of compounds. Some become eroded almost immediately and are washed away in 15 minutes to 24 hours. Others are almost unaffected. Alcoa has found that compounds which will survive this test for an 18-day exposure are satisfactory—and field experience has shown this to be a reliable indication of good performance.

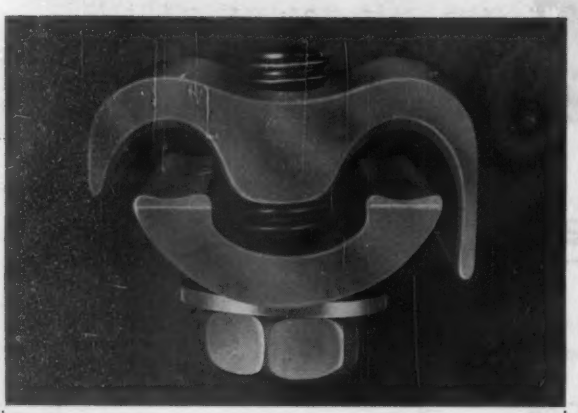
Currently under test and development is a new Alcoa compound which has met and exceeded all requirements.

Compact power... concentrated power



That's the quick way to sum up the characteristics of the Model 60A Hydraulic Compressor. The Alcoa 60A delivers 60 tons of thrust for the application of compression accessories for line construction or maintenance work with any commercial conductors up to and including the 1,590 MCM size. It operates at 10,000 psi and is used with remote pumps that may be hand operated or driven by either electric or gasoline power. For the past six years Alcoa has offered the Model 60A as *the* rugged, fast, convenient portable tool for ground or aerial use. Also, consider the economy of the 60A; most compressors in its price range deliver 40 tons of pressure or less. The Alcoa dies designed for use with this 60-ton compressor are priced modestly so that even greater savings are possible. For complete specifications about this money- and timesaving tool, contact your Alcoa-Rome representative.

(Continued on next page)



Here are just a few of the many groove shapes studied by Alcoa before selecting the most efficient contour for bolted connectors. They typify the thoroughness with which Alcoa approaches every accessory problem.

We've added a new one!

In 1953 Alcoa developed an improved groove contour for bolted connectors intended for use over a range of conductor sizes. Both varied pressure and resistance tests, and heat cycling showed the effectiveness of this groove shape when proper aluminum alloys were chosen for the connector design.

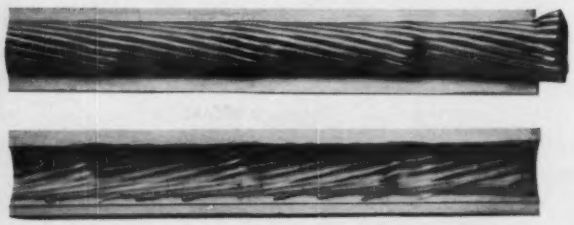
This addition to our widely imitated line of Universal Parallel Groove Clamps is designated Cat. 395.5. It economically connects a range of conductors from #6 to 1/0 in either groove. Like other extruded Alcoa® pg clamps, the 395.5 has a unique "breathing" action which, during temperature changes, provides the flexing spring action needed to assure good conductor contact. Extruded in a strong heat-treated aluminum alloy, the new 395.5 clamp is compact, easily taped, and can be applied without being taken apart. Get the full story about this new clamp, or more details on others in the 390 series—including those prefilled with Alcoa joint compound and packed six to a box—by contacting your usual source of Alcoa materials.

Continuous compression is best

Alcoa has always taken the position that facts should speak for themselves. And the facts, based on years of testing joining methods for conductors of all sizes and types, point to this conclusion: Longer die bites and continuous compression offer more *consistently reliable* joints, under service conditions of maximum severity, than does the skip-bite method. By reliability we mean electrical resistance lower than an equivalent length of the conductor, mechanical strength in excess of 95% of the conductor rated strengths, and the ability to *last*.

The use of longer dies—with each bite overlapping—not only gives better performance with ACSR, but also with special conductors.

Of course, tools of higher capacity are needed for the continuous-compression method. So Alcoa makes tools larger, more rugged, to insure better performance.



Cutaway view shows strand-imbedment on inner surface of sleeve, following use of continuous-compression method. All evidence points to the superiority of this technique over skip-bite.

Alcoa compression accessories are, in many cases, more conservative in design than those of other suppliers, since *reliability* is still considered to be the basic consideration. The continuous-compression method is also strongly supported by these additional advantages: Inspection for proper application is easy, even from a distance; sleeves are straighter after compression; and there is no need to match die width to skip-bite markings. And the smooth surface provided by this method of compression is especially important in the design of component parts for Extra High Voltage applications.

Alcoa sells the tools, the dies, and the compression accessories, carefully designed to make *consistently reliable* connections using the proved continuous-compression method. The Rome-Alcoa salesman will be glad to provide details.

Summing up:

Water erosion adversely affects many joint compounds—but not those made by Alcoa. A new compound, soon to be released, performs well on this and all other counts.

More useful power per dollar is what you get with Alcoa's Model 60A compressor.

New Cat. 395.5 pg clamp is now available for conductors ranging from #6 to 1/0.

Take a big bite, and do it continuously, for consistently reliable joints.

Your nearby Alcoa-Rome salesman is eager to supply additional information on any or all of these items. Why not call him today? For the name and address of our nearest representative, write to Rome Cable Division of Alcoa, Dept. ACR-7, Rome, N. Y.

ALCOA

ROME CABLE

DIVISION

Electrical World

SEPTEMBER 4, 1961
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HOW TVA DESIGNED its 1,300-Mw Paradise Plant

The Electrical Week

FUTURE NEWS ▶ **Signing of a third R&D nuclear contract** by Empire State Atomic Development Associates (ESADA) can be expected later this month. The seven New York investor-owned utilities making up ESADA are negotiating for the contract.

LATE NEWS ▶ **Information about utilities** is being gathered by staff of Sen Estes Kefauver's antitrust subcommittee. Effective opposition by electric utilities against adding generating facilities to the Hanford NPR reactor triggered the search for possible antitrust violations. At this stage there is no plan to report the findings or hold hearings.

More liberal feasibility criteria for multipurpose hydroelectric projects leads Corps of Engineers district offices to re-examine what have been borderline or uneconomic projects. A case in point is Keystone Reservoir on the Arkansas River, Okla. The Corps Tulsa office says installation of 60 or 70 Mw of generation may now be feasible on the basis of 100 years amortization instead of the previous 50 years, and by dropping "taxes foregone" in figuring earnings. Keystone is under construction without power facilities.

Senate Antitrust & Monopoly Subcommittee says it will subpoena divisional profit and loss statements of General Electric and Westinghouse for 1954-60, to be returned Jan. 10.

Six pole-line hardware manufacturers file for a bill of particulars asking where and when alleged price fixing meetings occurred. The six were indicted in Milwaukee for price fixing.

Houston Lighting & Power Co resumes electrical service to a Navy berthing station on Pelican Island—without a contract. The company objected to government contract provisions against racial discrimination in employment, and the Navy picked up its own electrical load with destroyers. Now an HL&P source says, "We are supplying the base with electricity while we are continuing negotiations."

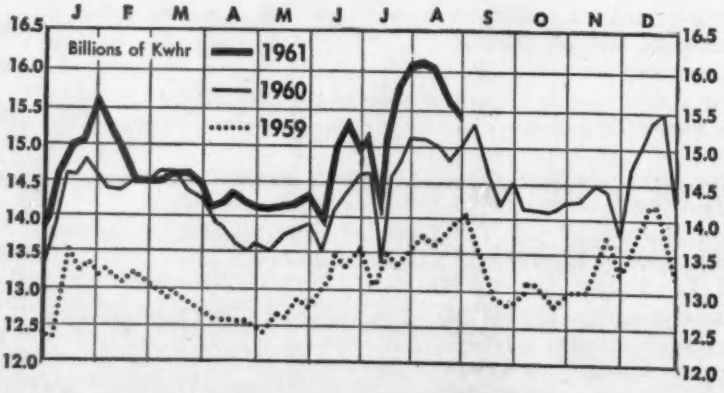
Rates are reduced an estimated $390,000 annually by Pennsylvania Power & Light Co in a move to improve its competitive position in the heating market.

Great Britain's first single-purpose (for power only) nuclear power station, Berkeley, goes critical. It has two 138-Mw units. A second nuclear power plant, Bradwell, with two 150-Mw units, is scheduled to go critical in a few days.

Lewis R. Gaty, Philadelphia Electric Co vice president of research and engineering, dies after long illness.

WEEKLY POWER OUTPUT—Up 3.1%

(Week ending Aug. 26), Kwhr 15,491,000,000



Per Cent Change From Previous Year

	Aug. 12	Aug. 19	Aug. 26
Total U.S.....	+ 6.9	+ 5.4	+ 3.1
New Eng.	+ 9.7	+ 4.6	+ 8.4
Mid. Atlan....	+ 9.6	+ 4.6	+ 6.4
Cent. Indust...	+ 5.1	+ 4.0	— 0.6
West Cent. ...	+10.2	+ 8.9	— 1.8
Southeast	+ 5.1	+ 3.0	+ 3.1
South Cent....	+ 6.9	+11.7	— 2.8
Rocky Mount...	+ 7.4	+ 5.8	+11.0
Pacific			
NW	+ 3.9	+ 2.5	+ 1.6
SW	+10.1	+ 8.3	+14.7

Seasonally Adjusted Index 284

Week Ago 286 Year Ago 277

Source: Edison Electric Institute

Supply Lines

UTILITIES ALMOST MAINTAINING ANTICIPATED CONSTRUCTION PACE

A preliminary report on Electrical World's interim survey of 1961 capital expenditures by investor owned electric utilities shows that these utilities are maintaining construction programs at almost the pace anticipated early in the year. (The final report, compiled from more complete returns, will be reflected in the annual forecast published Sept. 18).

Returns to date show that recent expenditure estimates are down 3.8% from earlier estimates. This is considered normal and is caused by unforeseen construction delays and overambitious programs. Only in a rare case has a utility reported a cutback in spending due to a slowdown in kilowatthour sales growth, and these cutbacks have been slight.

The largest shift is in generation expenditures which are now pegged 5% lower than anticipated late last year. Transmission plant spending is down a mere 1.5% from earlier estimates reflecting increased activity in this area. Distribution spending, as usual, is now estimated to be 3.7% lower than the amount forecast in the earlier estimates.

Only two regions show gains over earlier total estimates, and these gains are minor. They are the Pacific region with a negligible gain, and the Mountain region with a gain of 1.6%. All others show a downturn with the South Atlantic region reporting the largest cut (6.7%) followed by the West South Central region (5.5%) and the Middle Atlantic region (5.1%).

HOUSE OF REPRESENTATIVES APPROVES IDENTICAL BID BILL

The House of Representatives has approved a bill which would require federal department heads to report to the Attorney General all identical bids over $10,000 received on government contracts. The measure was introduced by Rep. Wright Patman (D-Tex.). The Senate has not yet acted on the bill.

In effect, the bill would give congressional sanction to a recent Presidential order calling on department heads to make such reports. However, it would go further than the President's order by requiring affidavits from all bidders on government contracts affirming that prices were reached without collusion and that the bidder had no prior knowledge of other prices bid on the same contract. The bill would also invite state and local agencies to submit identical bidding reports to the Justice Department.

PRICING OF DISTRIBUTION TRANSFORMER TAPS CHANGED

A change in the pricing of taps for distribution transformers has been announced by Standard Transformer Co. For units rated three through 100 kva, the company is now charging $8 net per tap; for units over 100 kva, the net price is now $25 per tap. Previously, the company had been following the industry norm of using a percent adder for adding taps to a transformer, so that the large transformers have a large tap price. But Standard says the cost of putting taps in a coil is fairly

constant because it is composed primarily of labor cost plus the cost of the tap changer. It says its move thus recognizes this fact.

LOS ANGELES TRIES TO TRIM NUMBER OF DAMAGE SUIT DEFENDANTS

The Los Angeles Department of Water & Power has decided to cut down the number of defendants it has named in damage suits resulting from the Philadelphia electrical antitrust cases. As a result it, has filed motions in Federal District Court in Los Angeles asking that the judge allow the damage complaints to be amended accordingly. But as with any motion, the judge has scheduled hearings for September 19 on the matter and it is not known whether there will be any opposition, especially from those companies which are being kept as defendants. One reason for opposing would be that should the defendants lose the case, the more defendants there are, the less the damage burden on any one company.

If the judge allows the amendments, this would not be the first time it has happened in connection with the Philadelphia cases. A couple of months ago, a federal judge in the state of Washington allowed the Chelan County PUD to drop the names of Federal Pacific Electric Co, McGraw-Edison Co, and I-T-E Circuit Breaker Co from a damage suit, leaving as defendants General Electric Co, Westinghouse Electric Corp, and Allis-Chalmers Manufacturing Co.

The reason for the Los Angeles move, according to a LADW&P spokesman, is to make a "cleaner-cut, tighter, less complicated suit." The specific companies were so picked because the Department's purchases from them were nil or negligible during the critical period, the spokesman said. And he added that the Department's move was of its own instigation and that no negotiations were involved with the companies.

Companies sought to be dropped by the Department in six out of eight suits filed are Moloney Electric Co, Wagner Electric Corp, Kuhlman Electric Co, Federal Pacific, I-T-E, Sangamo Electric Co, A. B. Chance Co, H. K. Porter Co, Inc, and Porcelain Insulator Co. Those companies who would remain as defendants are GE, Westinghouse, Allis-Chalmers, McGraw-Edison, Lapp Insulator Co, and Ohio Brass Co. Products involved in the suits are power and distribution transformers, circuit breakers, power switchgear assemblies, capacitors, and insulators.

Meanwhile, the Philadelphia Electric Co has filed five more damage suits against 14 manufacturers. Equipment purchases involved total some $3 million. Philadelphia Electric had previously filed 11 other suits (EW, Aug. 14, p 23).

Also in Philadelphia, Federal Judge Harold K. Wood has set Sept. 25 as the date when he will hear arguments on the government's motion to allow the Federal Trade Commission to see the documents and grand jury transcripts dealing with the antitrust cases. The FTC wants to determine whether the electrical manufacturers' recent antitrust troubles also involved violations of 1938 FTC cease and desist orders (EW, Aug. 7, p 14).

Finally in California, the reasons behind the state's decision not to bring antitrust damage suits in behalf of cities and districts as originally planned were said to be: (1) Lack of funds; and (2) the question of justification, as the state was not a direct party to the case.

ADDED BEAUTY FOR LOCATIONS like this. The Styled Mercury unit directs the light downwards and eliminates glare. It illuminates 11,000 square feet to 3 footcandles. You need fewer and shorter poles, and less wiring, to get the desired level of light.

ANOTHER IN THE FAMILY of modern Styled Mercury luminaires. The entire line is all-aluminum, with Holophane® refractor. Choice of 1000, 700 or 400 watt ratings. Available in choice of brushed aluminum finish or five decorator colors.

FOUR OF THE LATEST design units provide excellent nighttime illumination for traffic and pedestrians on this busy street in a shopping section.

L-M Announces Another Graceful Design In The New Styled Mercury Light Family

Line Material's Styled Mercury luminaires are a family of high quality, high intensity lighting units. The latest addition to the Styled Mercury line is the upsweep design installed in the well-lighted street shown above.

These are large, handsome luminaires, styled for Line Material by a noted industrial designer. They will contribute daytime beauty and excellent nighttime lighting to any street, park, mall, public square, or parking area.

Line Material is a leading manufacturer of outdoor lighting with 50 years' experience in the design and application of street and highway luminaires. L-M also provides competent Lighting Application Service by experienced lighting engineers.

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Ask the L-M Lighting Engineer or Field Engineer for bulletins, or mail the coupon.

OUR 50TH YEAR 1911 — 1961

LINE MATERIAL® Industries

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Outdoor Lighting

McGRAW EDISON

522

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Line Material Industries, Milwaukee 1, Wisconsin

Please send me details on L-M Styled Mercury family of luminaires and the new units. EW-94

Name_____

Company_____

Address_____

City_____ State_____

Type of Area To Be Lighted_____

9 billion dollars to build a better one.

We're living in a needing, buying, growing America—a time for new and improved products and services—the creation of new jobs. More than ever, a businessman with an idea, with the urge for something better will move ahead with our expanding economy.

But after the idea, what follows can be a costly period of research and development. Not necessarily—if you use the immense 9-billion-dollar fund of research and patent information that's available at your U.S. Department of Commerce. Think of the saving—in time and money.

For example: there are reports on extensive research by your Government in new products and processes. A translation of data on inventions and discoveries abroad—information on over 3 million patents—a fortune in patents owned by your Government. All this is yours—for your use and your benefit.

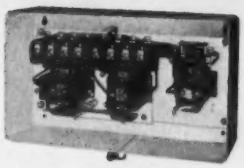
Take advantage of the many ways in which your business can grow. In developing new products and services. In the lucrative foreign markets. In new U.S. markets. In attracting new industry to your local community. Just phone or write the U.S. Department of Commerce Office of Field Services in your city, or Washington 25, D.C. Your U.S. Department of Commerce is always ready to help you grow with America!

NOW'S THE TIME TO GET GROWING IN A GROWING AMERICA!

Your A-B Handy Catalog Lists These Control Devices Often Considered "Special"

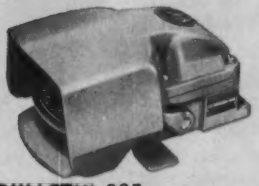
BULLETIN 840
Float Switches

These quality switches are available in a wide range of types for automatic control of motors operating tank or sump pumps. The snap-action switch mechanism assures positive operation, no matter how slowly the liquid level changes.



BULLETIN 1270
Automatic Transfer Switches

These switches are designed to transfer power-load to standby supply when normal power fails or drops too low. Automatically returns load to normal supply when power is resumed. Mechanically interlocked.

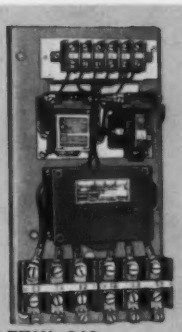


BULLETIN 805
Foot Switches

Ruggedly built to withstand the most severe industrial usage. Snap-action switch mechanism features maintenance free silver contacts. The foot switch shown above assures complete "safety" for the operator. Also made without top guard.

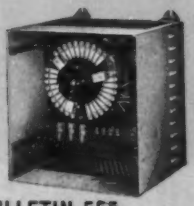
BULLETIN 836
Pressure Controls

For machine tool hydraulic systems operating at pressures up to 5000 psi. Oiltight enclosure. Operating pressure and differential are adjustable. A visible indicator shows trip point. Maintenance free silver contacts.



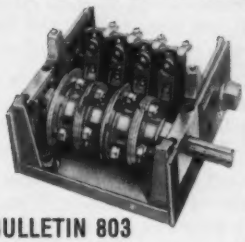
BULLETIN 812
Phase Failure—Phase Reversal Relays

Style F relay (above) protects against all open phase conditions on a branch motor circuit. Style R disconnects the motor upon a phase reversal. Style RF gives phase failure and phase reversal protection.



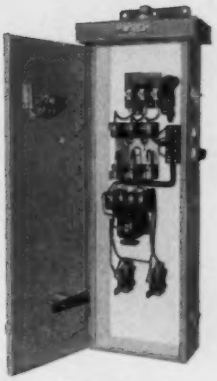
BULLETIN 555
Speed Regulators

Provide manual speed control of wound rotor motors for either fan or machine duty. When used with magnetic starter, the first step closes control circuit.



BULLETIN 803
Rotating Cam Limit Switches

Heavy-duty controls for use on automatic production machines. Made with up to 12 independent circuits which can be separately adjusted for operation at any point of rotation.



BULLETIN 1232
Pump Control Panels

Complete units for automatic operation of irrigation and oil well pumps. Employ standard A-B Bulletin 709 magnetic starter with manual disconnect switch or circuit breaker in weatherproof enclosure. Wide variety of optional features available.

BULLETIN 365
Multi-Speed Drum Switches

Designed for manual starting, speed changing, and reversing of polyphase multi-speed motors. Made for up to four speeds either non-reversing or reversing.

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QUALITY MOTOR CONTROL

patent applied for

PROTECTION AGAINST MAIN LINE DAMAGE

Blackburn SC series clamps offer an effective way to protect main conductors against damage from hot line taps without the use of armor rod. Tap is made on extended bail . . . not on the main conductor.

High clamping force of massive clamp is maintained over large contact area, making a low resistance, cool operating main line connection. A low resistance, balanced current path is fed to the bail from both legs of the clamp. The bail is mechanically bonded to the clamp body with interlocked tubular compression sealed joints.

Castings are of high strength, non-copper bearing aluminum alloy. Clamps may be used on either aluminum or copper mains. When used on copper it is necessary to order prefilled with Contax, a highly efficient inhibiting paste. Bails are provided in bare copper, tin plated copper or aluminum. All bails are available straight or with a 45° offset.

Blackburn stirrup clamps are easily installed hot or cold. Hex nuts or eye nuts (that fit all shotgun sticks) are available. A permanent steel spring secured to the body of the clamp imparts a strong snap grip on the interlocking jaws, supporting the clamp on the main while bolts are being tightened. Only two clamps cover a main wire range from No. 4 AWG through 397.5 ACSR.

For complete information, write for catalog data sheet and samples.

Jasper
BLACKBURN
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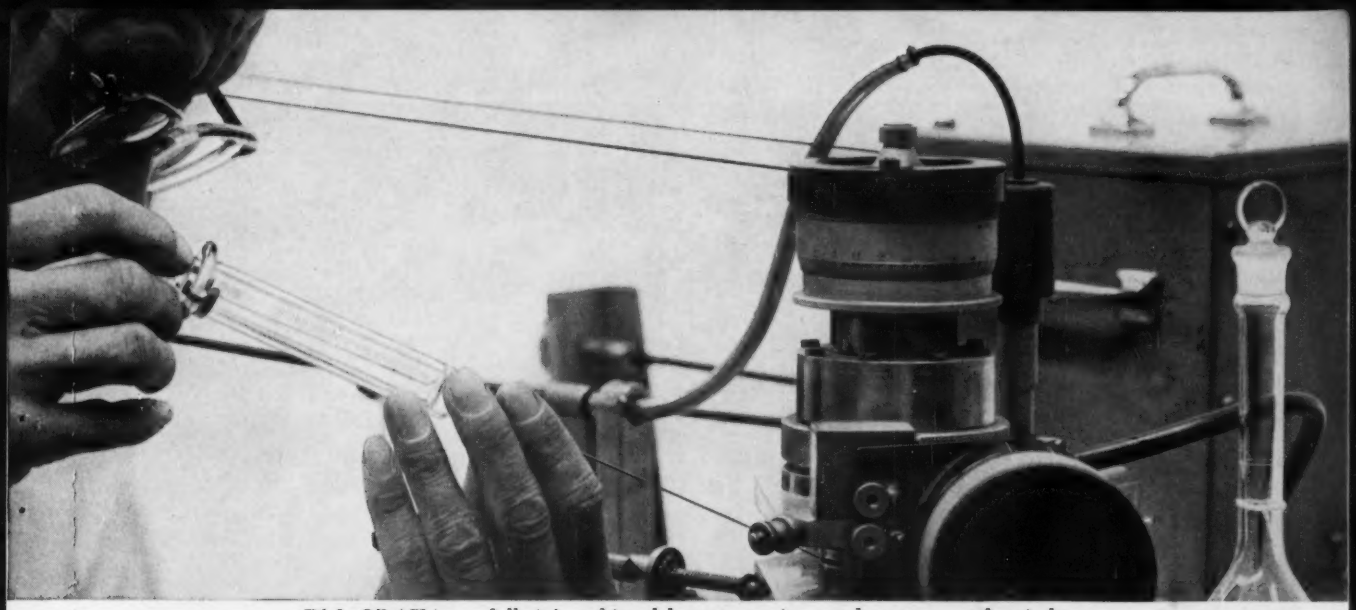
1525 Woodson Road • Saint Louis 14, Missouri



Diala Oil AX is carefully injected into laboratory equipment that measures electrical properties of the oil. This is one of the ways Shell makes sure that dielectric strength is high.

BULLETIN:

Shell reveals how Diala Oil AX lasts up to 5 times longer than ordinary oils

Only an oxidation-inhibited transformer oil of exceptional quality can be expected to give long service life under today's severe operating conditions.

That's why a growing number of utilities are switching to Shell Diala Oil AX. Read how Diala® AX helps them hold costs down—and how it can do the same for you.

THE DISTRIBUTION transformer is of constant concern to most utilities. It often operates outside its rated capacity during peak periods. Temperatures run high. And transformer maintenance costs are on the rise.

All of these factors have prompted utilities to search for a stable transformer oil that can help protect overloaded equipment, extend transformer life and reduce maintenance.

The answer for many utilities: Shell Diala Oil AX.

What Diala does

Diala AX contains a special Shell-developed oxidation inhibitor.

Accelerated laboratory oxidation tests show that Diala AX can provide satisfactory service *up to five times as long as* uninhibited oils.

Because of the oxidation inhibitor in Diala AX—and also because of Shell's selected base stocks and refining techniques—this remarkable transformer oil is exceptionally stable. It resists sludge formation. It helps prevent the creation of metal-attacking acids. And it reduces peroxide build-up which can damage many types of insulating materials.

Diala AX has also demonstrated an ability to extend the life of fabric insulation materials. In Shell's Emeryville, California laboratory, scientists soaked cotton insulating threads in many different oxidized oils—and for varying periods.

Conventional oils, when oxidized, weakened the thread by 25 to 40%. When subjected to the same oxidizing treatment, Diala AX had negligible effect on the thread's strength.

Diala AX has excellent dielectric properties (see photo above), good heat transfer characteristics and a very low pour point. Its low volatility reduces evaporation loss. And its flash point is high for maximum safety.

Call your Shell Representative

Ask your Shell Industrial Products Representative for all the facts on Diala AX. Or write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y.

SHELL

A BULLETIN FROM SHELL
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This man won't be back...

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No maintenance is ever required on a CADWELD Electrical Connection.

CADWELD offers: 1. Engineering Service, 2. Field Service.

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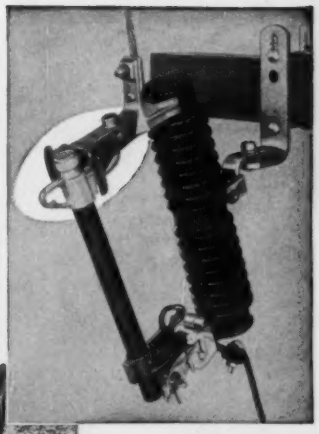
"FOLLOW-ACTION" CONTACTS OF KEARNEY "GX" CUTOUTS

...eliminate danger of external arcing
...prevent recoil damage



KEARNEY

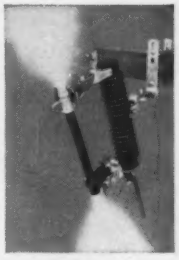
"FOLLOW-ACTION"

LOCKS CONTACTS CLOSED UNTIL FAULT IS INTERRUPTED

Stainless steel springs in the top contact assembly of the Kearney GX cutout, absorb shock... and by "following" any motion of the cartridge created by recoil impact, keep the top contacts firmly locked together under high pressure until the fault has been interrupted. Contacts cannot separate during interruption to cause external arcing or contact burning.

Ball and socket contacts are self-aligning, cannot be bent or twisted out of alignment by severe faults, and always seat properly regardless of the angle of cartridge close-in. Dependable, safe operation is assured.

Balanced Double Venting . . . prevents recoil damage. Expendable cap blows on high faults. Expulsion gases discharge from **both** ends of the GX cartridge to equalize pressure and neutralize recoil shock. At the same time, relief of excess pressure within the cartridge prevents tube bursting. On low amp faults, the GX cartridge single-vents from the bottom only, assuring ample gas pressure for positive interruption.



Cast Bronze Hood . . . prolongs cutout and contact life by protecting top "follow-action" contacts from severe weather and ice. Hood also shields contacts from dirt and corrosive elements, providing added insurance of dependability and long life. Extra-wide entry jaws guide cartridge securely into contacts even at awkward close-in angles.

Contact your Kearney Sales Representative or write for Bulletin 1A.

512

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When You First Put It Up...

Any 6M Strand will

support 6,000 lbs...

TIME BRINGS OUT THE DIFFERENCE

RUSTABLE STRAND GETS WEAKER— ALUMOWELD STRAND KEEPS ITS STRENGTH

When you buy strand you want the strength you specify—and you want that strength to last. So why waste good money on ordinary strand that can't resist corrosion—that starts to rust away and weaken *after* you install it. Unlike rustable strand, Alumoweld's initial strength remains permanent year after year.

With its *thick* covering of aluminum—25% by area—permanently welded to a strong steel core, Alumoweld gives you the same high resistance to corrosion as solid aluminum. It's made by the exclusive atomic-welding process in which the ductile weld remains permanent under all operating conditions. Corrosive elements can't reach the steel core because of the durable protection of the *thick* aluminum covering.

Diameter for diameter, Alumoweld Strand has the same strength as extra-high-tensile steel—yet, it weighs less and is easier to install. Its initial cost is surprisingly low. In fact, because it will stay up far longer, Alumoweld Strand will actually *cost less* as the years go by.

Alumoweld Strand gives you performance where it counts—on the job! Send for Engineering Bulletin E. D. 3000 and get the full story on Alumoweld's important, money-saving advantages. You'll see why Alumoweld Strand is preferred by so many efficiency-minded, cost-conscious companies.

Supplies of Alumoweld Strand are available for immediate shipment from our warehouses in New York, Chicago, Pittsburgh and Memphis.

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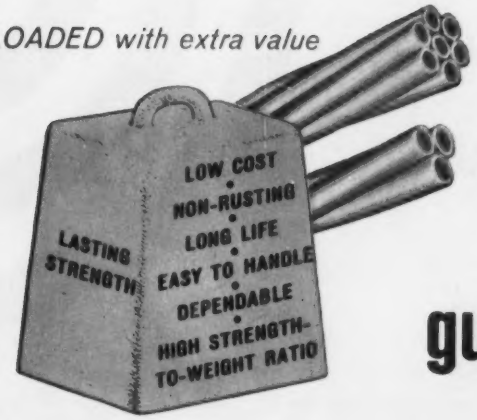

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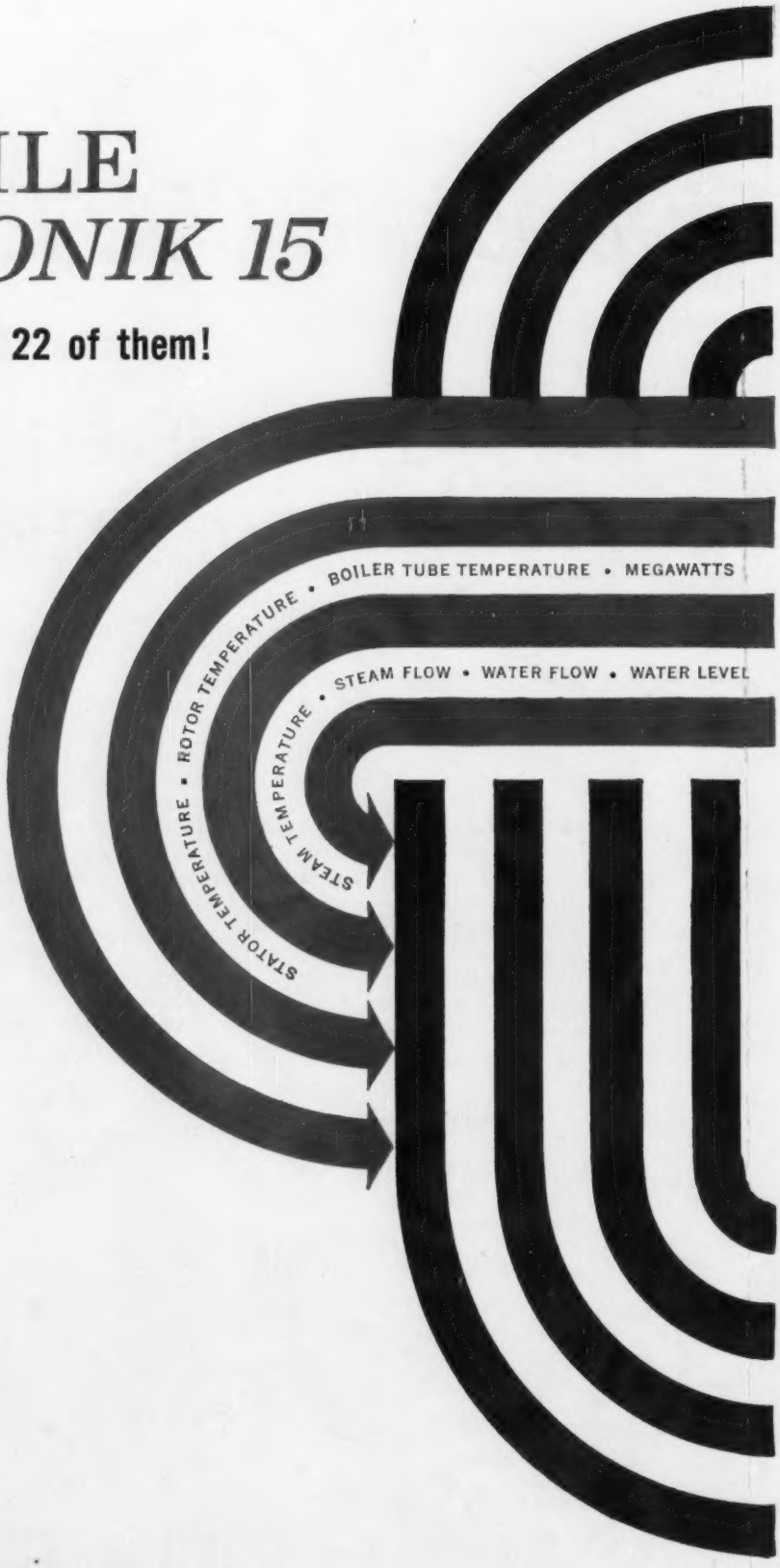
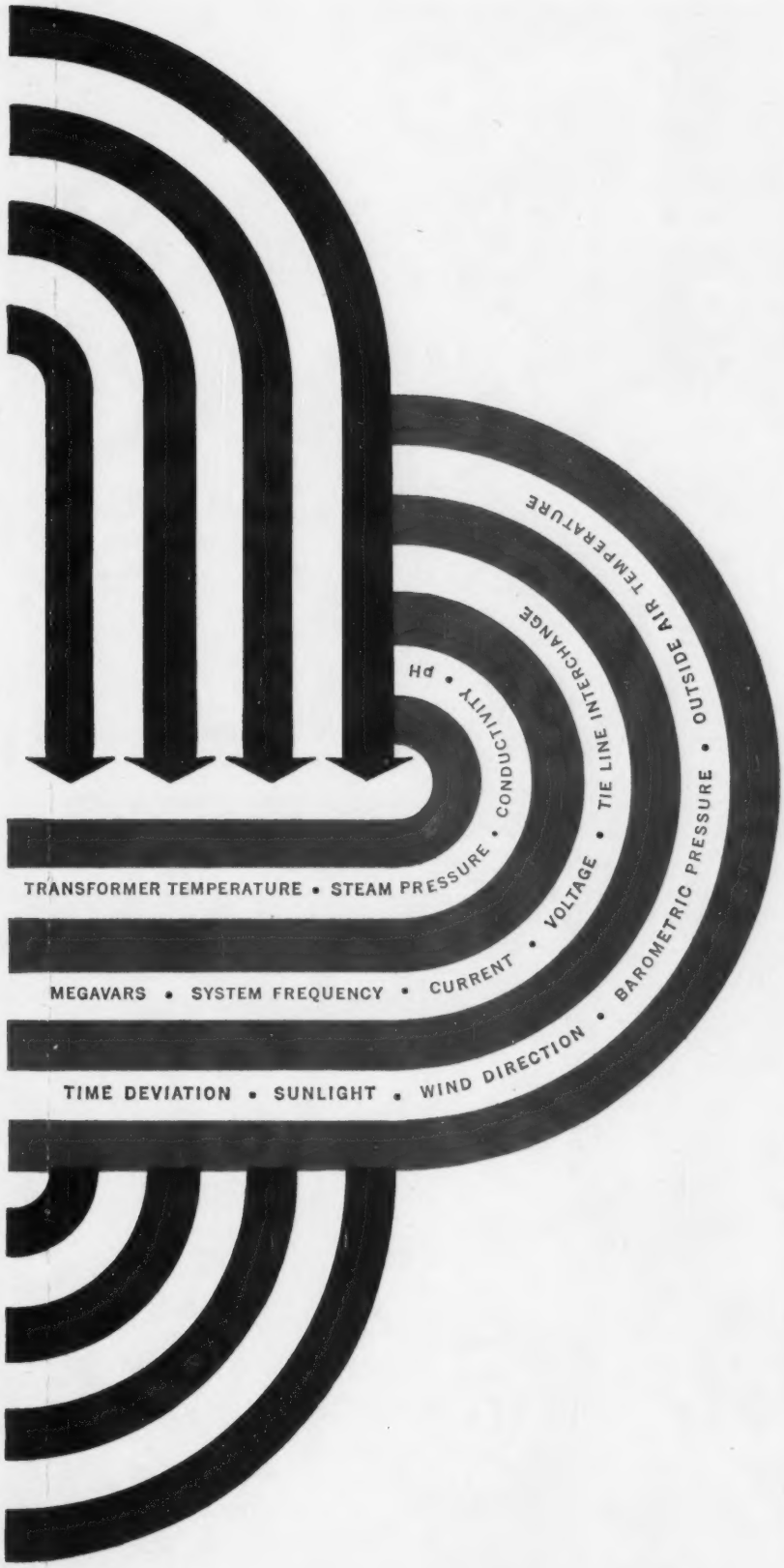
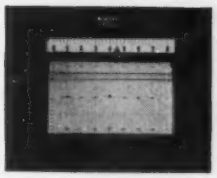
VERSATILE *ELECTRONIK 15*

records and indicates all 22 of them!


STATOR TEMPERATURE • ROTOR TEMPERATURE • BOILER TUBE TEMPERATURE • MEGAWATTS
STEAM TEMPERATURE • STEAM FLOW • WATER FLOW • WATER LEVEL


AIR TEMPERATURE • OUTSIDE BAROMETRIC PRESSURE • TIE LINE INTERCHANGE • VOLTAGE • CURRENT • SYSTEM FREQUENCY • MEGAVARS • WIND DIRECTION • SUNLIGHT • TIME DEVIATION • CONDUCTIVITY • pH • STEAM PRESSURE • TRANSFORMER TEMPERATURE



Generating Stations and Dispatch Centers depend on Honeywell *ElectroniK 15* instruments to keep a close check on more than 22 variables . . . from watts, vars, steam flow, stator temperatures . . . to system frequency, tie line interchange, and time deviation.

ElectroniK 15 gives a choice of many measuring circuits, types of records or indication, pen or print wheel speeds . . . lets you incorporate a wide variety of functions or devices. The newly designed modules in the *ElectroniK 15* line have operating and servicing features that represent the very latest developments in the art of reliable instrumentation. Its 11-inch calibrated chart width provides easier, more accurate reading. 112 Honeywell service and sales offices throughout the country are dedicated to the job of keeping *ElectroniK 15* instruments in top operating condition.

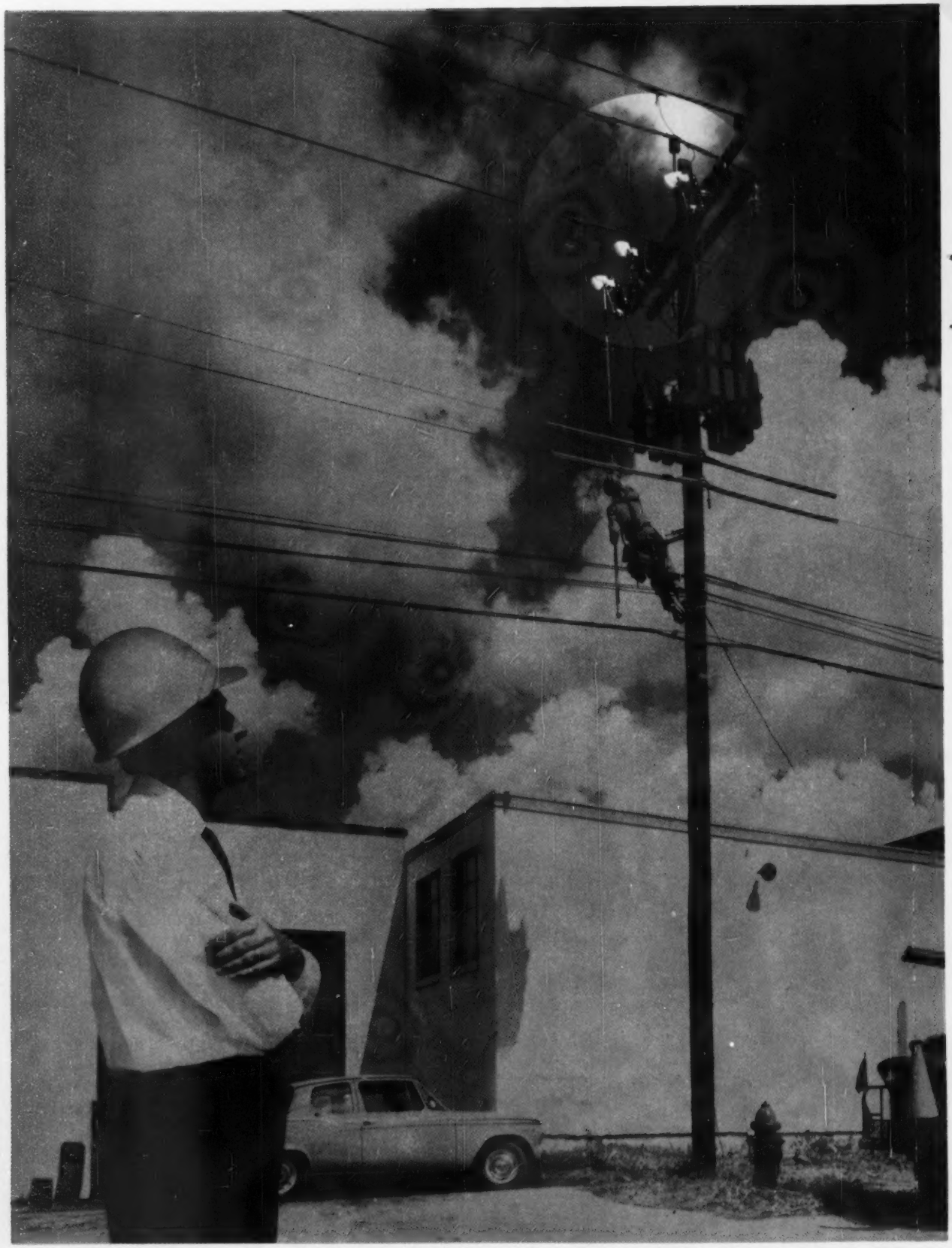
With *ElectroniK 15* on the scene, it is no longer necessary to be strapped to a single line of instruments. Many leading utilities throughout the country already know about *ElectroniK 15's* performance and dependability. You can get the facts on the *ElectroniK 15*, too, by contacting your nearby Honeywell field engineer. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Honeywell

First in Control

SINCE 1885

HONEYWELL INTERNATIONAL Sales and Service offices in principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.



New Westinghouse LBU Loadbreak. Test Operation photo, made on lines of Houston Lighting and Power Company.

When the Westinghouse LBU Loadbreak was tested, the line appeared to be dead!

There was no noise, no visible gas . . . but the line *wasn't* dead! If you test this loadbreak in daylight, you might not see the arc flash . . . and you, too, may think you have opened a cutout on a dead line. Just pull it open . . . and the new Westinghouse LBU simply and safely breaks up to 200 amperes.

NO MAINTENANCE—The LBU operates without special loadbreak attachments. There is no fuse link or other parts to replace after operation. Just open it, with a standard hookstick, and load is interrupted. Close it, and service is restored.

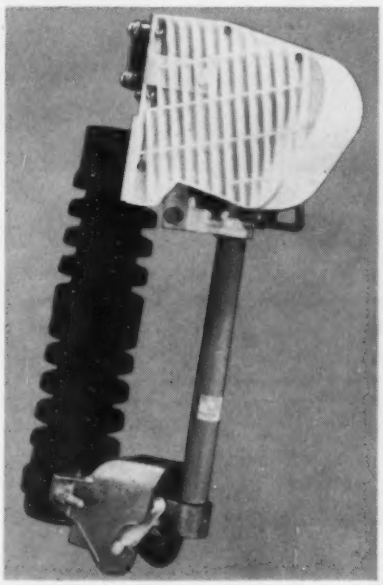
EXCLUSIVE DOUBLE-DUTY DESIGN—Only Westinghouse has this new arc-chute design, made possible by development of a new acetal resin that has exceptional non-tracking quality. The LBU is both a 200 ampere loadbreak and a 100 ampere open fuse cutout with fault interruption ability to 16,000 amperes at 15 kv.

SAFE AND RELIABLE—The arc is confined within the chute. There is no chance of external arcing. When the blade is released, a de-ionizing gas is generated from the acetal resin by the arc heat. The LBU's loadbreak operation is unaffected by rain, sleet, snow or ice. After 200 laboratory operations at full interrupting rating of 200 amperes, the LBU arc-chute showed only negligible wear.

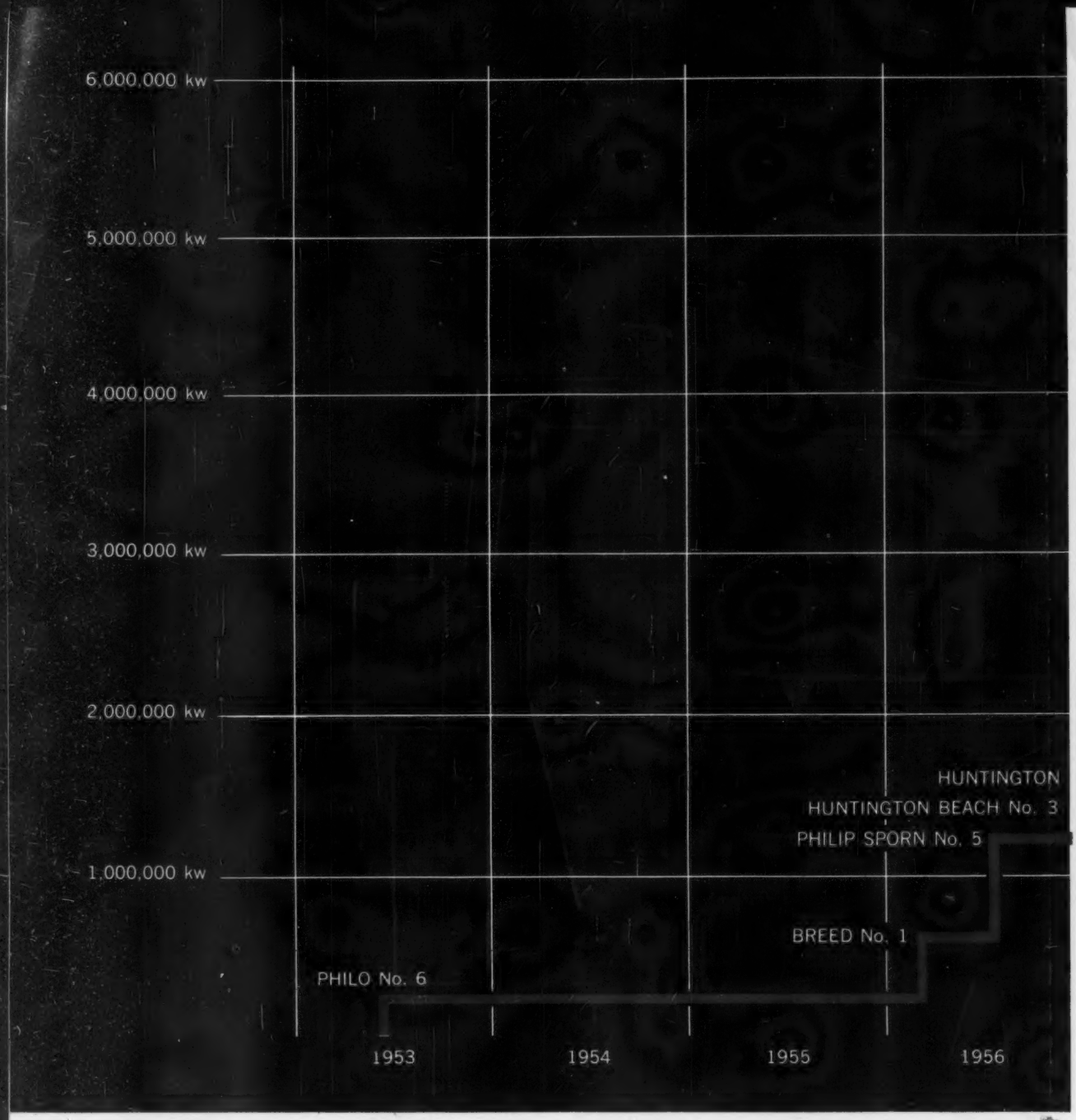
A NEW CUTOUT, TOO—The LDX (not shown) is a new Westinghouse Open Fuse Cutout. It has the same new nonferrous design as the LBU, without the loadbreak feature. Both the heavy-duty and extra-heavy-duty classifications are available in either 7.8 or 15 kv ratings.

For complete information, call your Westinghouse Sales Engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

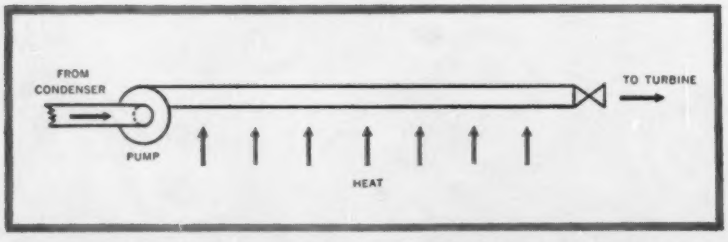
J-65002



Westinghouse



Acceptance for B&W Universal Pressure steam generator

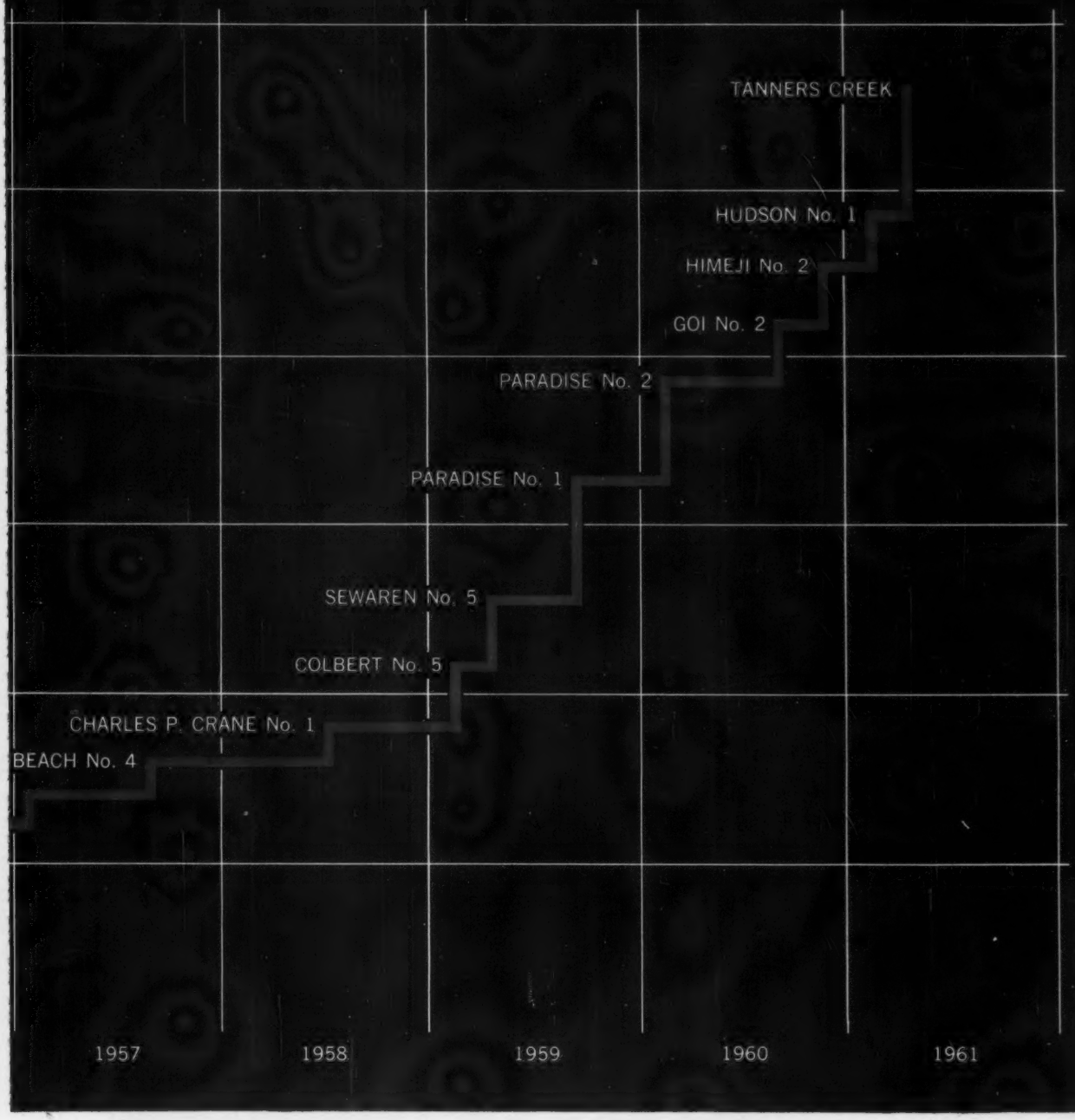


The Universal Pressure steam generator is a true once-through boiler. In effect, a long tube. Water enters at one end, picks up heat, changes to steam, becomes superheated and leaves the other end at the desired temperature and pressure.

Fourteen Universal Pressure steam generators are now installed or on order from Babcock & Wilcox. Five will operate at turbine throttle pressures of 3500 psi and higher. Nine are for operation at 2400 psi.

These 14 plants represent a three-quarter of a billion dollar investment by the utility industry.

What is behind the trend to the Universal Pressure boiler? There are four major reasons.



keeps growing. Orders now top 5,500,000 kw.

1. Increased availability. The Universal Pressure steam generator is a true once-through unit. Its inherent simplicity has resulted in 95 per cent boiler availabilities.

2. Increased economy. Ability to maintain steam temperatures over the entire load range improves the plant's overall efficiency. B&W's flexible by-pass system permits start-ups with minimum fuel and economical low-load operation.

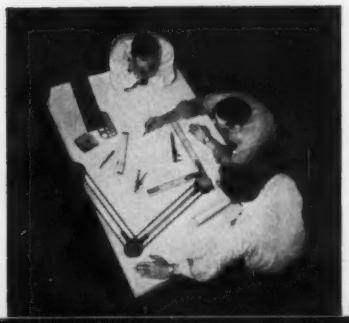
3. Lower maintenance costs. After trip-out, the Universal Pressure steam generator can be entered for maintenance in 2½ to 3 hours. Fast cold starts and hot restarts can be made without thermal shock to turbine parts or steam piping. The condensate polishing system provides maximum protection against boiler or turbine deposits. Gas conditioning minimizes superheater creep, corrosion, and slagging.

4. Reduced overall plant capital costs. A Universal Pressure steam generator weighs approximately 20% less than a drum boiler. Foundations can be smaller and less expensive. Less steel is required. Erection is simpler and faster.

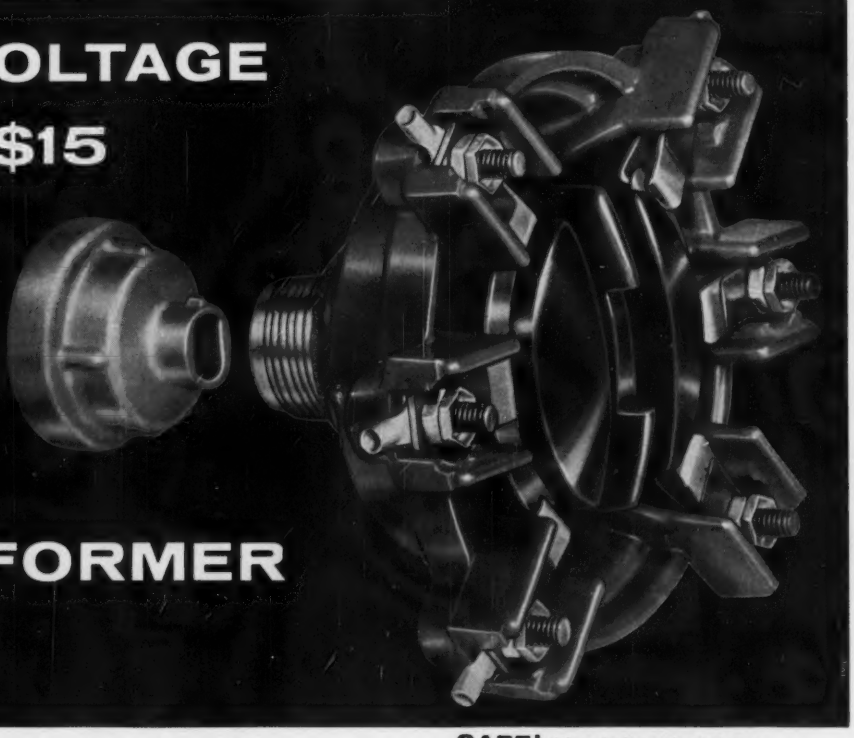
For more information write to: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

Babcock & Wilcox

CONCENTRATION



DUAL VOLTAGE SAVES $15 OR MORE ON EVERY TRANSFORMER



Concentration on one idea has resulted in the new RT&E thoroughly tested and reliable Extern-O-Switch. This redesigned dual voltage switch makes **dependable** cut-over of entire areas to higher voltage at savings of $15 or more per transformer.

Extern-O-Switch body is made of an entirely new compound — a specialized glass-reinforced Polyester thermoset material. It is highly shock resistant and actually extinguishes arcs passed over its surface. Impossible to track, its characteristics are not affected by transformer oil or heat. Electrical insulation levels are increased by 50% with this exceptional material.

The unique externally operated handle reduces changeover to a simple twist of the wrist. Key-type handle cannot be removed unless the switch is correctly positioned. Inside, high pressure contact is assured. New leaf springs behind each contact prevent metal fatigue and provide lasting, positive contact pressure.

RT&E's concentrated research program developed these improvements to reduce man hours and save money. Protect your investment, look to RT&E — originator of the dual voltage transformer and externally operated switch.

Engineering Talent Concentrated On One Idea — **A BETTER TRANSFORMER**

RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON • ARLINGTON, TEXAS

SAFE! Unique keying action between handle and slotted ring around shaft assures positive positioning before handle can be removed.

TT

Editorial Comment

SEPTEMBER 4, 1961

Implications of the Turn-Key Contract Merit Serious Study

The incidence of two manufacturers' fixed price, turn-key contracts for the construction of electric generating plants last year triggered considerable thinking within the industry as various segments sought to appraise their roles. Manufacturers, utilities, and consulting engineers were caught in the plaguing questions that arose.

The turn-key concept, it became apparent, had many ramifications. In the extreme these could involve a complete realignment of roles played by the various segments of the industry.

In this week's Management Newsletter (p 65) we are seeking to set the turn-key contract in perspective and in a second Newsletter next week we will examine some of the reactions to this controversial subject.

The present quiescence in turn-key contracting affords the industry an opportunity to devote some serious study to its long-term implications. The apparent inactivity turn-key contracting is no more excuse for drawing unwarranted conclusions than was the emergence last year.

Southwest Power Pool Makes a Challenging Offer to TVA

We hope that the Tennessee Valley Authority will give thoughtful consideration to the offer by the 11 Southwestern investor utilities for an exchange of power amounting to as much as 1,500 Mw on a seasonal basis. We would also hope that no doctrinaire position will prevent the ultimate acceptance of this offer.

We see it as a bold, constructive step toward more efficient and more economical operation of the nation's electrical systems.

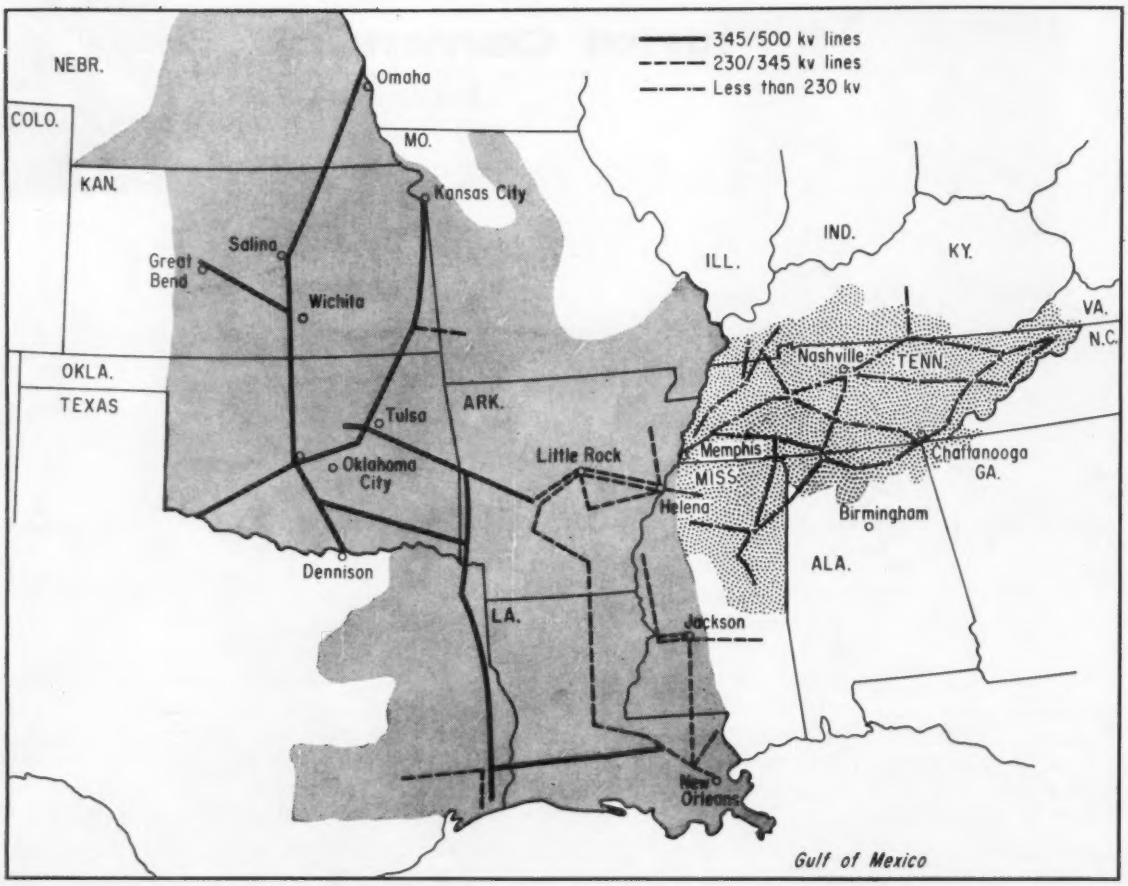
As has been said on these pages before, such interconnections are inevitable. The companies of the Southwest Power Pool have displayed both courage and wisdom in taking the initiative to bring this one about in the near future.

The offer would appear to preserve the integrity of existing systems, both investor-owned and government-owned.

It would appear to afford substantial benefits to the customers of all the utilities involved.

It would appear to be well within the policy objectives of both TVA and the Southwest Power Pool. TVA has smaller scale agreements of this type with one investor utility and with the City of Memphis. The Pool was organized for such exchanges among its members.

We like to see this kind of offer.



MAIN TRANSMISSION LINES of systems include, at left, proposed 230 and 345-kv system of Southwest Power Pool in dashed and solid lines. TVA system, at right, has no voltage above 161 kv at present. Ties through Arkansas and Mississippi would provide the interchange. Present ties could not handle proposed 1,500-Mw transfer

TVA Studies Southwest Proposal

The Tennessee Valley Authority is studying a proposal from the Southwest Power Pool for an exchange of seasonal surpluses between the giant systems. The 11 company SWPP announced that it would be willing to exchange up to 1,500 Mw with TVA.

There was no initial TVA reaction to the investor-owned plan, under which SWPP members would send surplus winter power to TVA and the authority would return power in the summer. Southwest Power Pool has a summer peak, while TVA's peak is in the winter.

The offer to exchange power was made in a letter from J. Robert Welsh, chairman of the executive committee of the Southwest Power Pool, to Gen Herbert Vogel, board chairman of TVA. It was made after a study by the investor-owned companies was completed earlier in the summer on the feasibility of the plan.

In the letter Welsh pointed out that such an exchange was in keeping with the industry policy of providing for system interconnections to facilitate interchange of electric energy. He said that a member company had reached general agreement with TVA after two years of negotiations on a diversity capacity exchange, and that by all of the pool companies joining in the proposal a much greater amount of power could be exchanged with corresponding greater benefits.

The proposed ties would provide seasonal peak interchange between two systems of approximately equal capacity. The 1961 summer capability of the 11 companies in the Southwest Power Pool is slightly over 10,000 Mw, according to Charles M. Custer, pool manager.

The 1961 summer peak to date of the pool and two associates is 7,948 Mw, and the forecast of anticipated 1961 winter peak is 5,843 Mw.

TVA's peak last January was 10,322 Mw, while the 1960 summer peaks held below 8,000 Mw for the summer months. TVA expects a winter peak of over 11,000 Mw.

According to preliminary plans the pool will need to build about $90 million of new lines to pick up 1,500 Mw at the TVA border and to distribute it around the pool. Plans of transmission lines are now being considered. It is believed that the pool's lines would include some, but not all, of the lines shown on the map above. Under present plans the distribution of the 1,500 Mw to member companies would involve

the 230 and 345-kv previously outlined (EW, Apr. 17, p 50) and possibly even higher voltages.

All lines planned by the Southwest Power Pool could be built in time to meet the Pool's 1964 summer peak, according to industry estimates. Although it appears that TVA will not need any outside capacity to meet its coming winter peak, the proposed interchange could go into effect right away. The present facilities, however, could not handle 1,500 Mw.

S. J. Sickel, vice president-operations of Kansas Gas & Electric Co, called the SWPP offer "the first fruits of the $300 million extra-high-voltage power grid we announced earlier this summer."

Southwest Power Administrator Douglas G. Wright hailed the SWPP proposal as a much needed step. "This diversity of peaks represents a resource that has heretofore been wasted," Wright told *Electrical World*. He indicated that the interconnection, if completed, would lead to others in the Missouri Basin, extending benefits of the diversity.

Industry observers noted that if SWPP could facilitate the interchange by constructing $90 million worth of transmission lines, it would be obtaining peaking power for approximately $60 per kw, a cost far below what can usually be obtained.

Member companies of the SWPP include Arkansas Power & Light Co, Central Louisiana Electric Co, Empire District Electric Co, Gulf States Utilities Co, Kansas Gas & Electric Co, Louisiana Power & Light Co, Mississippi Power & Light Co, New Orleans Public Service Co, Oklahoma Gas & Electric Co, Public Service Co of Oklahoma, and Southwestern Electric Power Co.

House-Senate Agreement On Hanford Seems Remote

Reconciliation of Hanford New Production Reactor (NPR) differences in a House-Senate conference seemed more improbable than ever last week.

Democrats in the conference committee had made it known they intended to vote out a one-generator "compromise" when the conference committee met in its second session. A first conference meeting got nowhere. With the 6-2 edge they hold in the conference, NPR proponents figure to ramrod their compromise measure through.

The single generator would supply 400 Mw of power, instead of the 800 Mw the two originally proposed NPR generators would have furnished. The compromise 400 Mw would supply the Hanford on-site power requirements by the time it goes into operation in 1964.

But the one-generator approach immediately drew fire from Rep James E. Van Zandt (R-Pa.), leader of NPR opposition in the House. Van Zandt wrote each House member to warn that the Democratic compromise would be "complete surrender to the will of the Senate" of the House's position on Hanford.

The House voted once to instruct its three conference managers—Van Zandt, Chet Holifield (D-Calif.), Mel Price (D-Ill.)—to stand fast against NPR power, but each conferee has the legal right to vote as he wishes.

The probability now is that the Senate will accept the one-generator compromise and send it to the House. The House then must accept the conference report's compromise or reject it, and in the latter case accept responsibility for holding up the Atomic Energy Commission's entire fiscal 1962 construction bill. Democrats count on the one-generator compromise and the pressure to move ahead with the construction bill to win enough votes to put the compromise over in the House.

It was this strategy that the Van Zandt letter sought to block.

In his letter, Van Zandt said:

"There have been increasing reports that a so-called 'compromise' will be offered in the AEC authorization conference for the addition of one unit of 400,000 kw of electric generating capacity at Hanford at a cost of $58 million. This proposal would, in effect, ask the House to consider a proposal which has been studied for approximately one week when the House has already expressed its opposition on three separate occasions to a proposal which had over two years of concentrated study. . . . I assure you that my position, which is in accordance with the instructions given to me as a member of the conference will remain unchanged. I look upon any attempt of the Senate to restore the Hanford project in full or in part as a challenge of the sovereignty of the House. I feel confident that if it is necessary to come back to the House for further instructions the vote against Hanford will be even larger than before."

A six-point analysis attacking the single-generator compromise was attached to the Van Zandt letter. The analysis charged:

"It would be almost impossible to prevent the government from going to next step next year" on a second generator; "construction of a 400,000 kw facility would still have the effect of putting the AEC in the power business on a very large scale, even though this power supposedly would be used exclusively at the Hanford station."

Heating Conference Registrations Roll In

Advance registrations point to a record attendance for the Fifth *Electrical World* Electric Heating Conference at the Sheraton-Park Hotel, Washington, D. C., on September 25 and 26.

Dr George Cline Smith, senior partner, MacKay-Shields Associates, will talk at the first morning session on "What's the National Housing and Economic Picture?" A panel will discuss future developments which could have an effect on the electric heating picture. Ray Edwards, Edwards' Engineering, will talk on off-peak heat storage, Dean Johnson, Rochester Gas & Electric Corp, on integrated lighting, heating and air conditioning, and J. J. William Brown, General Electric Co, will speak on new energy sources.

Preference Clouds Delaware Pact

Preference proponents say Delaware Compact Commission would in effect be an agency of the federal government

The issue of public power preference stands as the only barrier to creation of a long-sought Delaware River Compact Commission. This was made clear last week in hearings before the Senate Public Works Subcommittee on Flood Control, Rivers & Harbors.

Hearings have been completed, and the subcommittee is expected to consider and vote on the measure (S-856) shortly.

The preference issue could be the "nail," for want of which the whole compact could be lost, however. The issue turned on these points:

(1) Proponents for including the clause in the compact point out that, since the commission would, in effect, be an agency of the federal government, any power produced by compact projects should follow long-standing federal policy regarding preference. They add that present wording of the compact actually would work in favor of power companies in the area, to the detriment of preference bodies, and that no provision would be made for federal transmission lines to supply compact power directly to isolated preference systems, even if wholesale power were made available to them.

(2) Opponents of the clause point out that they are neither for or against it—that federal laws on preference probably are governing in the case of power projects, regardless of whether specific language is in the compact. Their principal concern is whether inclusion of a preference clause at this stage of the compact's creation might delay it indefinitely. They point out this change might require the compact to be returned to four governors, eight state legislative chambers (two per state) and the House of Representatives for reconsideration.

Udall Wants Preference

The issue of preference was brought to a head by Interior Secretary Stewart Udall in early August, when he agreed to remove the Kennedy Administration's objection to the compact if six changes were made. All parties were able to agree to five of these, but the sixth—preference — has become a stumbling block (EW, Aug. 21, p 36).

Udall, even though he has agreed to support the compact if all six changes are made, doesn't approve the basic concept of the compact, because he feels it rests too much power in the interstate body, rather than the federal government which has such responsibility already. He pointed out, though, that because of "unique circumstances and the apparent present willingness of the states to proceed with coordinated basin development," he would go along with the compact. But "Even with the proposed amendments, this type of federal-interstate compact should establish no precedent for future river-basin planning administration." Udall prefers the weaker river basin planning commissions, as proposed in a measure (S-2246) now pending before the Senate Public Works and Interior Committees (EW, July 24, p 25; Aug. 7, p 27, Aug. 28, p 37).

APPA Supports Preference

General Manager Alex Radin of the American Public Power Assn told the Senate committee that there were 17 municipal systems serving 125,000 customers in Pennsylvania within economic transmission distance of proposed power projects (Corps of Engineers) in the Delaware Basin, and "In our opinion, omission of the preference clause has the practical effect of handing over Delaware hydro power to the private power companies, and of preventing the small municipal systems and rural electric co-ops from having the opportunity of purchasing this publicly-generated power." Radin recommended the Niagara Power Project—developed by Power Authority of the State of New York —as a precedent for including preference in a state-owned power project.

Radin also opposed the compact commission's plan to make a profit on power sales to permit use of this revenue on other programs. This would be "reversing long-standing Congressional policy," said Radin. Sen Caleb Boggs (R-Del.) commented, however, that many municipal systems do this very thing.

"The traditional preference for non-profit electric distribution systems is conspicuous by its total absence," said Charles Robinson of the National Rural Electric Cooperative Assn, and "the proposed compact would, therefore, effectively exclude rural electric systems from participating in the hydroelectric benefits of Delaware River development. It would, in fact, practically guarantee that non-profit rural electric systems would receive absolutely none of the benefits . . ."

Corps Sees Big Potential

Robinson said that, while the Corps of Engineers had recommended only two power producing units — Tocks Island and Hawk Mountain with 67 Mw of conventional hydro capacity, 366 Mw of pumped storage hydro—"The real importance to the Delaware River Basin of hydroelectricity is not measurable . . . by the two units presently recommended. The potential for low-cost hydro, if measured by progressive standards, is substantial . . . the Federal Power Commission reports that the undeveloped conventional hydro potential of the Delaware Basin is about 1 million kw. And, in the course of its current investigation, the Corps actually investigated some 29 sites with that much total potential."

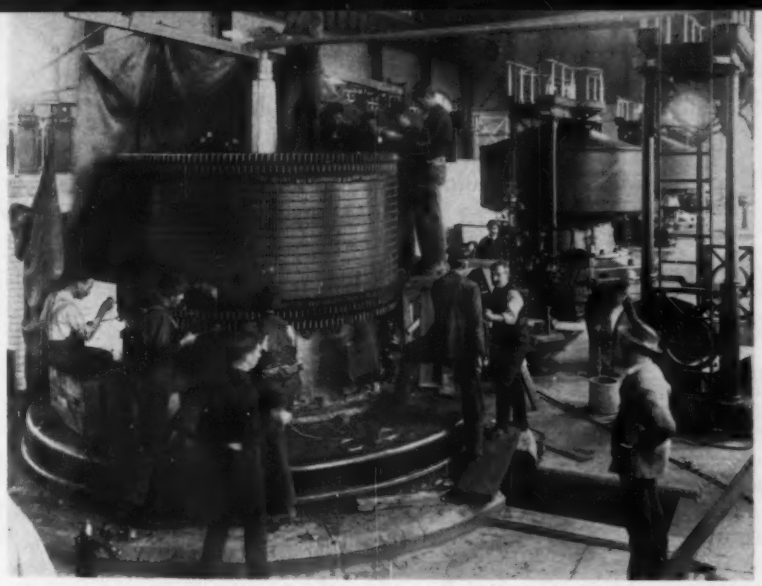
A specific plea for preference was made by an attorney for the Sussex Rural Electric Cooperative of Sussex, N. J.: "All of the power which we distribute to our members, we purchase from the New Jersey Power & Light Co . . . last year we paid the company 13.3 mills per kwhr for wholesale electricity. This is almost twice the 7-mill national average cost of wholesale power purchased by rural electric systems. It has been our hope that we might get relief from this difficult wholesale power situation when government hydro-electric dams are de-

veloped on the Delaware River . . . the language (of the compact now) seems to favor the New Jersey Power & Light Co and to leave us out of the picture."

Sen Joseph Clark (D-Pa.) summed up much of the opposition to the preference clause: "This compact is the result of 35 years of effort . . . agreement has not been easy . . . now, at long last, common sense has prevailed over parochialism. Only one major issue remains unresolved: public vs private power . . . I, personally, am for public power and the preference clause. But I am convinced that the people of my state and the other three states through which the Delaware flows are not—accordingly neither the governors nor the members of the state legislatures of the four states can be brought to favor a preference clause in this agreement. If it is inserted, it will, in my opinion, kill the compact . . . I submit that there is no need to write a preference clause into the federal enacting legislation approving this compact at this time . . . it will be time enough to argue the question of private vs public power at a later date when the time comes for the federal government to appropriate funds for the construction of a dam where a potential for hydroelectric power exists."

John Robin, chairman of the Delaware River Basin Advisory Committee, also pleaded for enactment of the compact as approved by the House, the governors and the legislatures. He said of the proposed addition of the preference clause: "There is some question as to whether a provision might not call for amendment of the compact in each of the states; and, very frankly, we do not think we could achieve such amendment.

"We are not zealots for or against public power," said Gov David Lawrence of Pennsylvania. "We believe that rational men will make rational judgments in the 100 years of this compact's life, and that general federal laws, undisturbed by the compact, can be depended upon to maintain established federal policies. We believe in short, that we have worked out an agreement which suits the Delaware . . . we are confident this one remaining matter (preference) will not be a rock which splits us."



ORIGINAL GENERATORS, such as this one being installed in 1895, still produce electric power at Edward Dean Adams Station, to be shut down this month

Interested Citizens Deciding Fate of Pioneer Hydro Plant

What will happen to historic Edward Dean Adams Station, pioneer hydro plant at Niagara Falls? This question is being asked by residents and newspaper editors of the Falls area, so far with no answer. With the Power Authority of the State of New York's nearby hydro plant now turning out 900 Mw, with more due before the end of the year, Adams Station and its neighbor, Schoellkopf Station, will be shut down early this month. The area newspapers and a citizens' committee are backing conversion of Adams Station to a museum.

The plant started production in 1896 when it supplied the US's first long-distance ac transmission line, a 20-mile circuit to Buffalo. *Electrical World* at that time reported, "At midnight, Sunday, Nov. 15, the long-distance transmission of electric power generated at Niagara Falls became an accomplished fact," and called the feat "one of the greatest engineering undertakings ever attempted." (EW, Nov. 21 1896, p 618.) The 25-cps current flowed "at 11,000 volts pressure" to supply Buffalo Street Railway Co trolleys.

The plant is named for electric-power pioneer Edward Dean Adams, then president and director of Niagara Falls Power Co, which built the plant. It later was one of the concerns formed into Niagara Mohawk Power Corp.

Famed American architect Stanford White designed the building that houses the 21 generators. These have never been replaced, though five were rewound in 1921.

The museum idea was proposed four years ago by James Marshall, an engineer and long-time resident of the city of Niagara Falls. Marshall, older than 90, died a few months ago, but a committee under banker Martin J. Travers of the same city is pursuing the idea.

The Smithsonian Institute is a booster, but its only expected involvement is a plan to put a scale model of the Adams Station generator on exhibit in Washington, D. C. Both Niagara Falls and Buffalo historical groups favor the plan.

New York's State Council of Parks expressed interest several weeks ago, but on Aug. 1 Council chairman Robert Moses, who also heads the Power Authority, stated that the Council of Parks was no longer interested because more important projects claimed funds.

Niagara Mohawk has no plans for the two plants beyond shutting them down this month as the Power Authority assumes the water rights.

- Single-purpose power projects would need new laws
- Vote on authorization not expected until next year
- Study would not be limited to any particular region

Pumped Storage Studied in House

Authorization for an Interior Department study of pumped storage power projects was considered by the House Interior Committee at a one-day hearing in late August. But additional hearings, and a final vote, probably won't be scheduled until early 1962.

The proposed study—and a companion one by the Corps of Engineers—had been discussed earlier this summer by the House Appropriations Committee; but the Interior Committee must authorize it before funds can be approved. Single-purposed pumped storage power projects, of course, are a sufficient variation from present water project laws that new authorization would be needed for the Interior Department to study or build them.

Policy Wanted Soon

Interior Committee chairman Wayne Aspinall (D-Colo.) said he understood the Appropriations Committee wants "a definite policy (on the studies) determined as soon as possible." However, it also was made clear that Aspinall's committee wants to hear more witnesses before it will consider the authorizing legislation proposed in two identical bills (HR-4809, HR-4843). Among the added witnesses would be Southeastern Power Administrator Charles Leavy and possibly Bonneville Power Administrator Charles Luce.

Aspinall cautioned the Interior Department that the proposed study must consider potential pumped storage sites, and their feasibility, with an eye on irrigation first and on power second. Studies would have to assure that possible pumped storage projects wouldn't affect water needed for irrigation, and that added pumped storage reservoirs wouldn't encourage evaporation losses.

Max Edwards, the Department's legislative counsel, agreed with Aspinall that such caution would be followed. He said the study would consider where federal pumped storage power projects would be feasible, under what conditions the federal government should permit non-federal systems to build such projects at federal reservoirs, and what federal laws would have to be changed to permit this.

Rep Hjalmar Nygaard (R-N. D.) criticized Edwards' claim that these projects could help bring in added revenues to the US Treasury from existing multipurpose projects. Nygaard said this was "misleading" —that the Treasury would get no more than its cost. And if added revenue came in, power rates probably would be cut.

Northern California and the Denver-Casper-Alcova areas of Colorado and Wyoming are likely areas for initial studies, the Committee was told by Dan McCarthy, of the Bureau of Reclamation's project development office.

Rep James Haley (D-Fla.) hit the Administration's "attempt," as he interpreted it, to get funds for a study without seeking authorization first.

Maj Gen W. F. Cassiday, director of the Corps of Engineers' civil works, said he felt the Corps already has "sufficient authority" to make such studies, and it hasn't completed a formal report on any pumped storage plans. He would prefer to wait until the Bureau of Reclamation determines its needs for power from such projects in certain areas, and then the Corps could study sites.

ASPINALL

FPC Endorses the Study

General Counsel John Mason of the Federal Power Commission told the Committee that the FPC endorsed the study as long as it is carried out "in cooperation with the Federal Power Commission." He said the FPC might be in a position to "contribute materially" to the studies, and he added, "In turn, studies of pumped storage problems along lines proposed in these bills would be useful to the Commission in connection with its licensing functions. . ."

Douglas Wright, Southwestern Power Administrator and recognized pumped storage advocate, said his area, including the Ozark Plateau, was the "most likely area" for pumped storage. He said pumped storage facilities could impose an off-peak load on thermal plants, keeping them operating at optimum efficiency.

He urged development of a plan for pumped storage because of the possibility of pumped storage facilities being built too rapidly, once their value has been proved. In fact, he estimated that 20% of the nation's power facilities would be pumped storage in the future.

Said Wright, "I do not believe that anybody ought to deny private industry the right to participate in this, but neither do I believe that the federal government, by owning these reservoirs and permitting this construction around their periphery, ought to hand private utilities a ballbat to beat their own (federal) brains out with on-channel generation . . . I do not think the utility companies want to do that; I think they want to work with us. . . We have no problem of working with the utility systems in our area (SWPA) on this study."

NYC–PSC Wrangle Breaks Out

City of New York disagrees with system changes recommended by the PSC for Con Edison's Manhattan service

A smoldering controversy between New York State's Public Service Commission and New York City's Commissioner of Water Supply, Gas and Electricity regarding steps to be taken to avoid future outages on the Consolidated Edison system broke out again when the PSC affirmed its previous report (EW, July 31, p 24). Commissioner D'Angelo of the city government had rapped the PSC's recommendations as "insufficient and inadequate."

The feud between the parties has flared ever since Con Ed suffered its 4½-hr outage on June 13 (EW, June 19, p 48). At that time D'Angelo asked, "How many more blackouts must we have before the Public Service Commission will recognize that the fundamental transmission and distribution system of the Consolidated Edison Co is not sound?" (EW, June 26, p 43).

In its initial report following the blackout, the PSC told Con Edison that the utility must apply the second contingency concept to its bulk supply system, and Con Ed has agreed to carry out the change. D'Angelo had called the changes "steps forward," but he warned that further steps are needed.

A new report by Harold L. Colbeth, PSC principal electric engineer, states that D'Angelo's recommendations envision the attainment of an impossible goal because ". . . no electrical engineer has found a way to furnish complete insurance against power interruptions."

Colbeth, in referring to D'Angelo's advocacy of supplying networks from two separate substations, pointed out that experience has demonstrated that supply of a single large capacity network from multiple substations results in unsatisfactory operation at times and that such a measure does not appear to be either beneficial or desirable for load conditions in Manhattan.

"If the recommendation with respect to substations is considered together with the recommendation to sectionalize the system further, the effect would appear to be an increase in the number of areas and substations and as a consequence an increase in the cost of service which might well be substantial without necessarily increasing the reliability of service," Colbeth said.

Acting Commissioner Alexander Lurkis, acting for the Dept of Water Supply, Gas and Electricity in the absence of D'Angelo, issued a statement in answer to the PSC which highlighted the difference of opinion.

"In our judgment," Lurkis said, 'the PSC is putting a rather low price tag on the safety of our citizens, in a city which Mayor Robert Wagner has so aptly said, 'lives, eats and virtually breathes' on electric power.

"Under the law, the responsibility for seeing that Con Edison constructs its transmission system in a way designed to secure uninterrupted service is vested in the Public Service Commission. It has taken its stand. We, in our department, disagree completely. We feel that the PSC requirements do not go to the bottom of the problem."

Consolidated Edison has withheld comment pending a report of an engineering study on its system undertaken by Stone & Webster.

News Scope

FREQUENCY CHANGE—As a major move in Niagara Frontier industry's conversion from 25-cycle to 60-cycle power, Becco chemical plant has been shut down for two weeks to complete a $1-million program that will eliminate Becco's need for 25-cycle power. Producer of hydrogen peroxide by an electrolytic process, Becco will switch its plant completely to 60-cycle power. The conversion involves installation of new, more efficient rectifiers; building a 115-kv substation to take 60-cycle current from Niagara Mohawk lines, and replacement of 25-cycle motors.

NEW RED TURBINE — New model of an industrial, one-shaft gas turbine is near completion at Leningrad Engineering Works, according to Czechoslovakia's *Technical Digest*. The 25-Mw turbine will drive a 30-Mva generator and may be fitted with a water boiler or steam generator for waste-heat utilization.

NO LOANS—July was the first month since the program began in 1936 that the Rural Electrification Administration did not grant any loans to borrowers. July actually was a "deficit" month, because recision of a previously made loan was authorized by REA in that period. First loan of the new fiscal year (which began July 1) was made on August 4: $10,000 to Ocracoke Electric Membership Corp, Ocracoke, N. C., to obtain two mobile generators while repairs are made.

OUTAGE—Long Island Lighting Co lost some 60,000 customers late Tuesday afternoon when thunderstorms, propelled by winds up to 80 mph, raged across the island, uprooting trees and tearing down overhead wires. Rain and hail accompanied the squall, which spent itself in a bare 15 min.

Although most customers were without service Tuesday night, all but 4,000 had service restored before 9 am the following day.

The Long Island Railroad sufered only minor delays due to the interruption of LILCO power for the operation of signals and crossing gates.

The storm, which tore down through Westchester County southeastward from Pleasantville and through nearby parts of Connecticut, caused less damage to Consolidated Edison Co installations. In Pleasantville, Groton, and Ossining, about 2,000 customers suffered interruptions lasting from a few minutes to 3 hr. In Yonkers, a blown transformer fuse deprived 69 customers of service.

Utility Selects 2,400 Psi for

Commonwealth Edison adopts steam-cooled division panels, turbine-driven feed pumps, outdoor economizer as features

R. G. SCHMIDT, Senior Engineer, Mechanical & Building Engineering Department, Commonwealth Edison Co, Chicago, Ill.

Steam conditions of 2,400 psi, 1,000/1,000F for the 510-Mw (net capability) Unit No. 4 at Will County Station of Commonwealth Edison Co were selected on the basis of considerable study and close attention to economics. A net heat rate of 8,947 Btu per kwhr is scheduled as expected for Unit No. 4, at an estimated direct investment cost of $127 per kw of net capability. Commercial service date for the unit is April 1, 1963.

Mechanical-side features of the new unit are:

1. Steam-cooled division panels in the 3.9-million lb per hr, forced-circulation, pressurized twin-furnace steam generator.

2. Three boiler feed pumps driven by 9,700-hp, 5,600-rpm noncondensing turbines.

3. Inlet silencers and sound-absorption material on forced-draft fans.

4. An outdoor low-level economizer for air preheating to reduce cost and add capability of from 2.9 Mw in summer to 8.3 Mw in winter.

5. Hydraulic couplings on the condensate pumps.

6. A 27-ft-dia spherical shell housing the deaerator.

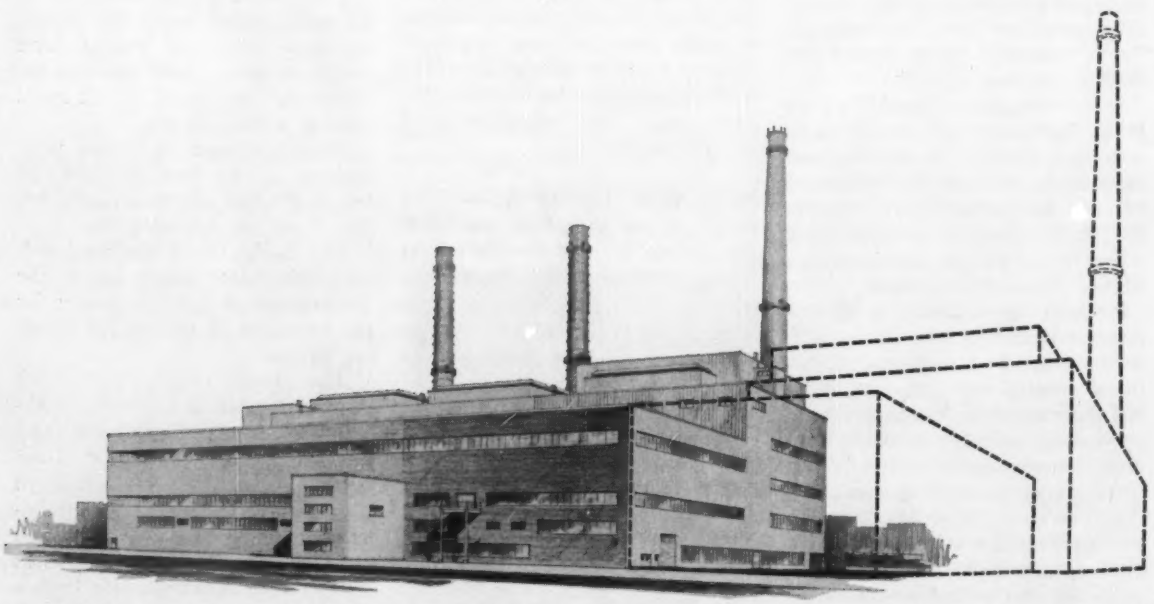
Model studies made of gas and air flows at vulnerable points played an important part in the plant design. The condenser manufacturer will model the condenser neck to find the best possible steam distribution to the condenser tube bank. The gas and air ducts associated with the precipitator and boiler have been studied in model form to obtain the most uniform air and gas distribution consistent with minimum resistance.

Studies Independent

Independent studies were made by Commonwealth Edison engineers and Sargent & Lundy, Engineers, project consultant, to determine the most favorable steam conditions. Throttle pressures ranging from 1,800 psi to 3,500 psi were considered with 1000F and 1050F superheat and reheat temperatures. These studies showed that supercritical steam conditions were not warranted under the present level of equipment costs. For a life-time capacity of 60.3%, and escalated fuel costs ranging from 29 to 38¢ per million Btu, both studies, based on estimated costs, favored 2,000 psi, 1,000/1,000F steam conditions. But quoted prices for major components clearly justified a steam pressure of 2400 psi, but not an increase in either superheat or reheat temperature.

General arrangement of the new unit will have the turbine, boiler, and auxiliaries within the main building. Forced draft fans, electrostatic precipitator, and a low-level economizer will be out of doors. The crib house superstructure will enclose only the traveling screens and circulating water pumps. The pump motor drives are being installed out of doors.

The 2,400-psi, 1,000/1,000F, cross-compound turbine- generator will have the high-pressure and a double-flow intermediate-pressure element on a 3,600-rpm shaft. The 1,800-rpm turbine will have two double-flow, low-pressure elements



EXPANSION OF WILL COUNTY STATION to house new unit is shown. Unit 4, to be added in 1963, will have 8,947 Btu net heat rate. Outdoor low-level economizers for air preheating will add 8.3 Mw to capability in winter

510-Mw Unit

with 38-in. last-stage buckets.

Guaranteed gross capability of the unit will be 532 Mw at 1 in. Hg. Maximum expected capability with throttle valves wide open will be about 553 Mw. The unit will be arranged to operate with the top high-pressure heater out of service for a limited time with an expected capability of about 582 Mw. The turbine gross heat rate at the guarantee point will be 7,679 Btu per kwhr. Station net heat rate is expected to be 8,947 Btu per kwhr.

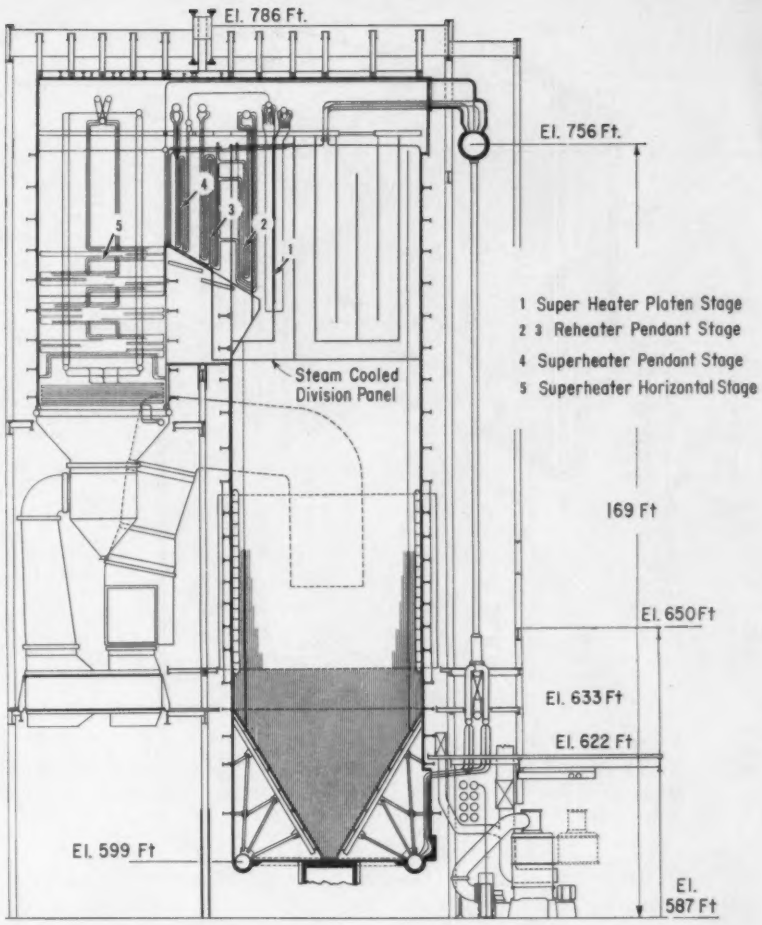
The generators have a combined rating of 640 Mva at 30 lb hydrogen pressure and 704 Mva at 45 lb hydrogen pressure. Load split at the guarantee point will be 288.5 Mw on the high-pressure and 243.5 Mw on the low-pressure machine. Each generator will be a single-winding, 20-kv, 3-phase, 85% PF, 60-cps machine with 0.60 SCR at 30 lb hydrogen pressure.

Both rotors will be hydrogen cooled; stators will be water cooled by a closed-circulation system. The high-pressure generator exciter and a spare unit will be rated 1,500 kw at 500 v; the low-pressure generator exciter at 750 kw, with rotating-amplifier-type voltage control for the excitation system. Exciters will be motor-driven.

The low-pressure generator will be neutral grounded through a grounding transformer having a resistor on its secondary. Because both machines will be tied together at generator voltage, the high-pressure machine and its connections will be protected from ground faults by the grounding equipment on the low-pressure machine. The high-pressure generator will not be grounded separately, and no surge protection is planned for either unit.

Two sets of 110-kv BIL isolated-phase bus duct will connect the generators to the 600-Mva, FOA, 19-138-kv, 550-kv BIL, 3-phase main power transformer, which will have two sets of low-voltage bushings. The generators will be cross-connected through the internal connections of the transformer's low-voltage winding.

Two unit auxiliary transformers each will be rated 10/12.5-Mva, OA/FA, 19.4-4.16-kv and will be capable of furnishing about 80% of the auxiliary power for the unit. A reserve auxiliary transformer rated 10/12.5-Mva, OA FA, 34.4-4.16-kv will provide start-up and shut-down reserve power. The 4,160-v switchgear will be on the main operating floor between the turbine and boiler rooms at the center of the electrical load.

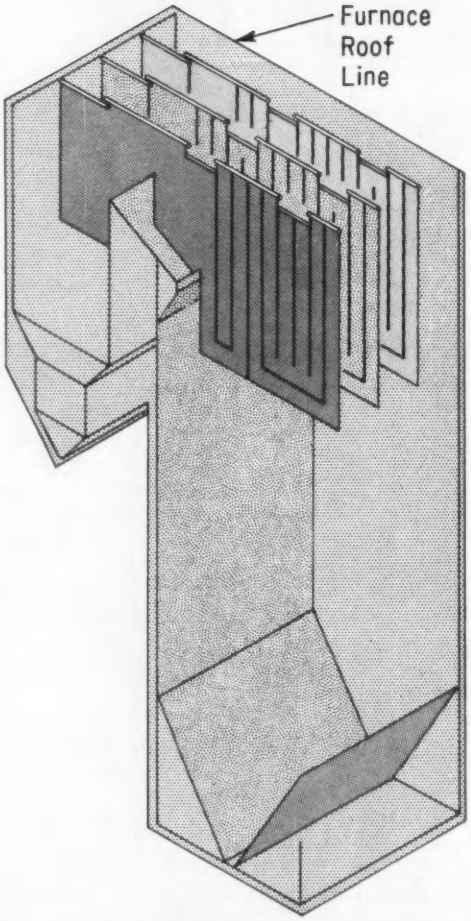


FORCED-CIRCULATION TWIN-FURNACE DESIGN for steam generator has identical superheat, reheat surfaces in both furnaces, an arrangement for pressurized operation, a common drum platen and steam-cooled division panels

The 3.9-million lb per hr steam generator will be a tangentially-fired, forced-circulation, twin-furnace design, both furnaces having identical superheat and reheat surfaces, arrangement for pressurized operation, and a common drum. Eight coal torches and four remote-controlled, retractable, oil-fired warm-up torches will be in each corner of the furnaces.

Because this unit will be remote controlled, flame detection devices will be installed. Four "canned" boiler water circulating pumps are arranged for 4,160-v operation. Retractable thermocouple probes will measure furnace gas temperatures to control steam venting and to warn of overheating during warm-up periods.

The 1,000F temperature and steam flow arrangement minimizes the amount of stainless steel tubing required. Tubes in the outer row in the superheater platen section are the only stainless steel tubes used. They are primarily for protection from the high radiant heat within the furnace. An unusual feature of this furnace design are the steam-cooled division panels. The panels continue as solid plate down to the economizer outlet. They will control the gas flow over the width of the furnace, through the convection pass, to obtain more uniform tube temperatures. Vanes in each lane at the economizer outlet will be ad-



STEAM-COOLED DIVISION PANELS control gas flow over furnace's width, through convection pass, to obtain uniform tube temperatures. Panels continue as plate to economizer outlet.

justed to get optimum flow conditions, after which they will be locked into position. The tubed section of the panels forms part of the steam circuit in the superheater.

Pressurized operation for this unit suggested that a water seal between the furnace bottom and ash hoppers be eliminated. The ash hoppers will be attached directly to the bottom of the furnace. An expansion joint between the hopper outlet and ash sluice piping will allow the combined movement of the furance and ash hoppers. The furnance floor will accommodate the full load of the ash hoppers to eliminate spring supports.

The bottom exhaust of the low-pressure turbine elements will discharge into two independent condensers, designed and valved to permit simultaneous reversal of circulating water flow in one section of each condenser for 100% backwashing and without differential back-pressures between the low-pressure turbines.

A study of 632 different condensers indicated the most economical and practical design would have 350,000 sq ft of surface with ⅞-in., 40-ft tubes and a water velocity of 7.0 fps. Three dry pit-type circulating water pumps, having a combined capacity of 396,000 gpm and six 10-ft wide traveling screens, will meet these needs.

With the arrangement of the low-pressure turbine elements, it will not be necessary to tie the two condenser shells together. The decision to install two independent condensers was also influenced by the size of the equalizing lines, required and the effect they would have on the turbine foundation design. To simplify the piping and control arrangement, four half-size condensate pumps will be installed, two pumps taking their suction from each of the hot wells.

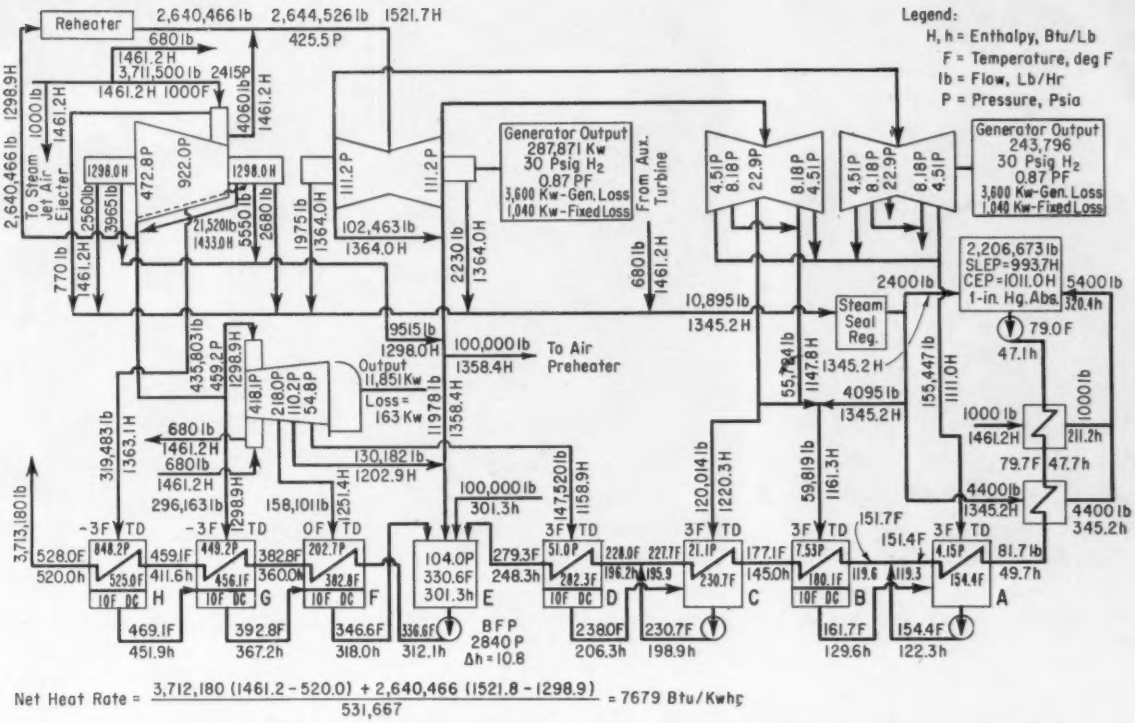
On all of Commonwealth Edison recent installations, cavitation control has performed this service. But, with the high capacity and head conditions of these pumps, 3000 cfm at 300 psi, it was felt that damage to the equipment from cavitation control may be so severe as to reduce the normal pump life expectancy.

Studies indicated that sufficient savings in power costs could be realized to justify the installation of hydraulic couplings. These couplings will permit the regulation of the pump discharge by varying the speed to maintain a controlled level of condensate in the hotwells. Use of these couplings, besides reducing the operating cost, will eliminate cavitational damage to the pumps.

Each of three boiler feed pumps will have a capacity of 2,050,000 lb per hr. Two pumps will be used normally, the third on turning gear being available for immediate use. The non-condensing steam turbine is more economical than motor or main-shaft drive for the boiler feed pump. The size of the electrical load, comprising motor-driven auxiliaries, will be thus reduced from about 6% to 3½% of total generation. This reduction affects the size of auxiliary power transformers and associated gear.

The 9,700-hp, 5,600-rpm boiler-feed-pump turbines normally will receive steam from the cold reheat line with an automatic transfer to the superheater outlet during start-up and low-load operation. They will be complete with turning gear, lubrication system, speed control, trip devices, and instrumentation for remote operation. A motor-driven pump with an 800,000 lb-per-hr capacity, capable of maintaining 600 psi at the boiler drum, will be used during startup.

An eight-heater steam cycle will be used. The two lowest-pressure heaters will be the horizontal two-shell type mounted in the condenser neck with a common bypass around both. There will be two vertical single-shell low-pressure heaters, three horizontal two-shell high-pressure heaters, and a deaerating heater.



EIGHT-HEATER STEAM CYCLE has lowest-pressure heaters (A, B) of horizontal two-shell type in condenser neck with common bypass; two vertical LP heaters (C, D); three horizontal HP heaters, (F, G, H) are in parallel circuits

The high-pressure heaters will be in two parallel circuits, each containing three heaters without individual bypasses. A common bypass will be provided around the parallel circuits for use in starting up. In an outage of one high-pressure shell, the circuit containing that shell will be taken out of service, and all feed water will be put through the other parallel circuit. When the top pair of high-pressure heaters are taken out of service to obtain additonal capacity, the feed water will continue to circulate through the tubes, but the extraction steam line will be closed.

To provide an adequate condensate storage supply for the boiler feed pumps and overcome space limitations, a deaerator having twin storage tanks was purchased. During the design period it was discovered that expansion problems dictated six expansion joints in the interconnecting piping. To avoid these joints, a 27-ft dia spherical shell will house the deaerator section as well as storage.

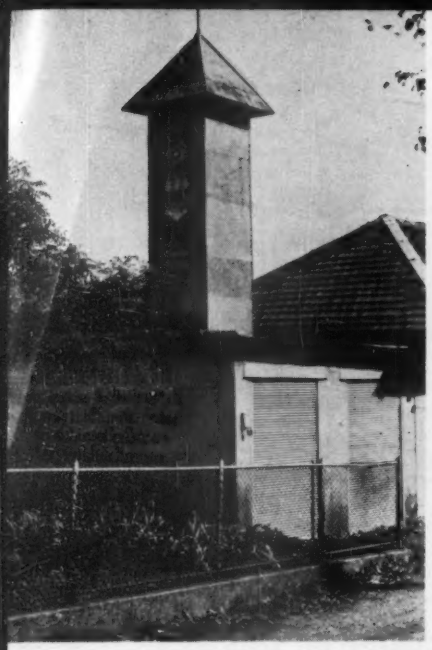
Considerable attention was given to noise abatement in the forced-draft fan area. The equipment is specified to have a maximum of 90 db in all audible frequencies at 10 ft from any fan or motor, all four fans operating. Thus inlet silencers will be used on the fans, with sound-absorption material on the fan housing, inlet boxes and ductwork between the fan outlet and the wall. The motor specifications called for a maximum of 85 db at 10 ft.

The four motor-driven, 900-rpm forced-draft fans will each have a design capacity of 360,000 cfm and a static outlet pressure of 40 in. of water. Volume will be controlled by inlet vanes. Ductwork will permit any combination of blowers and air preheaters. Water preheating coils in the discharge duct of each fan will preheat the air at full load to about 145F when the outdoor temperature is 0F.

Economic evaluation of combustion air preheating coils, using condensate from the main turbine cycle or a low-level economizer, indicated that the economizer would bring considerable savings as well as a capability gain of 2,900 kw in the summer to 8,300 kw in the winter. A low-level economizer in the gas ducts between the precipitator and the chimney will have heat exchanging surfaces of cast iron for greater resistance to corrosion. During water-washing of coils in the low-level economizer, flue gas will be bypassed to the chimney.

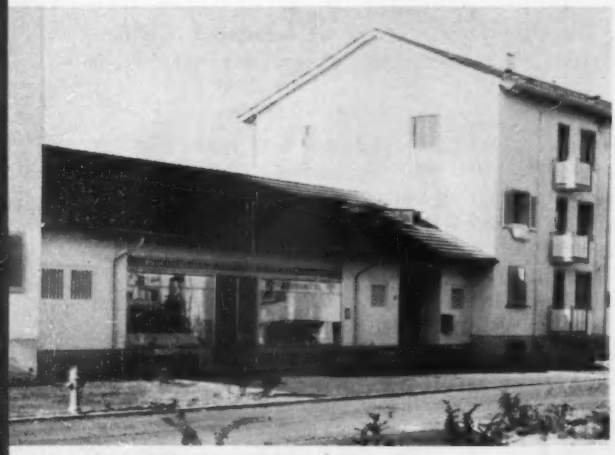
Four sets of coils will preheat combustion air to 145F before it enters the regenerative type air preheaters. The low-level economizer will lower the flue gas temperature to 220F. The heat extracted therefrom, transferred by circulating condensate through four independent circuits to the air preheater coils, will raise the temperature of the combustion air to 145F before it enters the air preheater During cold weather the circulating condensate returned to the economizer will be maintained at a minimum of 100F.

Each of four independent modulating control systems will divert a portion of the condensate flow to the deaerating heater in order to maintain a preset mean gas-outlet air-inlet temperature difference in its respective air preheater unless the 280F minmum gas temperature limitation control overrides the primary control.



TRANSFORMER SITE at Menzingen, built in 1895, continues in service today

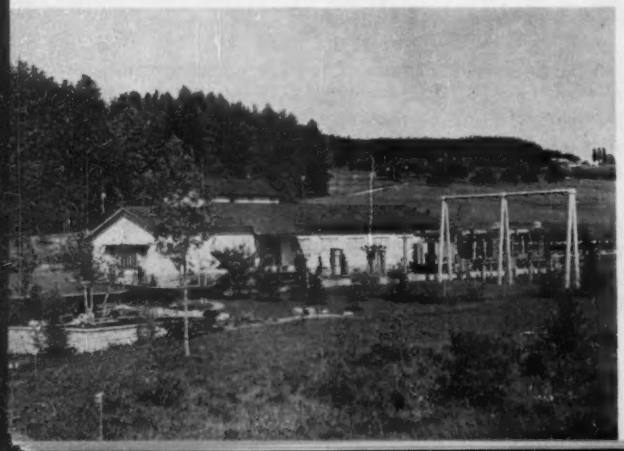
TRANSFORMERS were housed in this Thalwil 'castle' of 1896 contrasting with its contemporary (left) with tin-plate tower. This structure was razed in 1953



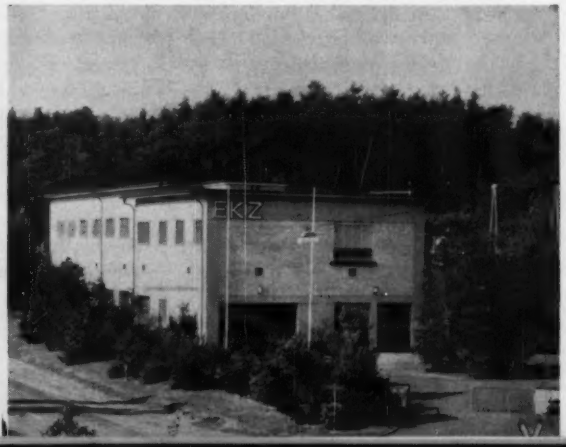
DIETIKON-GJUCH ROW HOUSES, with flats and shops, adapted to house transformers and switchgear (right)

PASSAGE gives access to transformers behind doors, circuit breakers at right, and admits firemen to courtyard

HERRLIBERG has this attractive substation in open area. This new substation is remotely controlled from Aathal



BUELACH SUBSTATION serves an industrial area. It has several ground-floor offices and garages used by EKZ



Swiss Develop New Designs

Picturesque transformer housings, substations make way for new in one of world's most highly electrified lands

HANS WUEGER, Technical Director, Cantonal Electric Utility, Zurich, Switz.

Transformer enclosures and substations of the Electric Power Utility of the Canton of Zurich (EKZ), Switzerland, one of the world's most electrified countries, have been transfigured as new requirements and new materials made new designs desirable and practicable.

EKZ supplies 118 communities directly and sells bulk power from its 16-kv lines to 58 municipalities. In 29 other places consumers are supplied, usually at 220/380 v, either by EKZ or by retailers. Load density varies considerably with the occupations and industries in the several areas. Nearly all energy is from hydro purchased from Nordostschweizerische Kraftwerke AG.

EKZ was founded in 1908. Hence, its physical plant, particularly its transformer housings and substations, has altered over the years. Originally, plant elements varied considerably in appearance, materials, and components, but today standardization is complete.

SMALLEST DESIGN out of 1911 competition is attended from the outside

ROOF DESIGNS were many. This unusual station is attended from inside

Some events influencing changes in transformer sites were:

1. An architectural competition in 1911, spurred by public criticism, which stressed the desirability of brickwork structures.

2. By the 1930s, the greater use of concrete made practicable a new type of functional structure.

3. Stations in dwellings, garages, and tool houses became numerous after barriers became available for attenuating transformer noise.

Formerly, overhead lines were used exclusively, and distribution substations were the indoor type just outside the city or village. Equipment was on three floors for stepping down from 50 to 8 kv. Each substation was attended by four and later by three men and had an assembly shop. After World War II, substations were constructed differently and had these features for reducing space and personnel:

1. Installation of a spare transformer eliminates assembly shop.

2. The 50-kv equipment is outdoor, only the 16-kv indoor.

3. Apparatus in substations is without oil and behind glass plates.

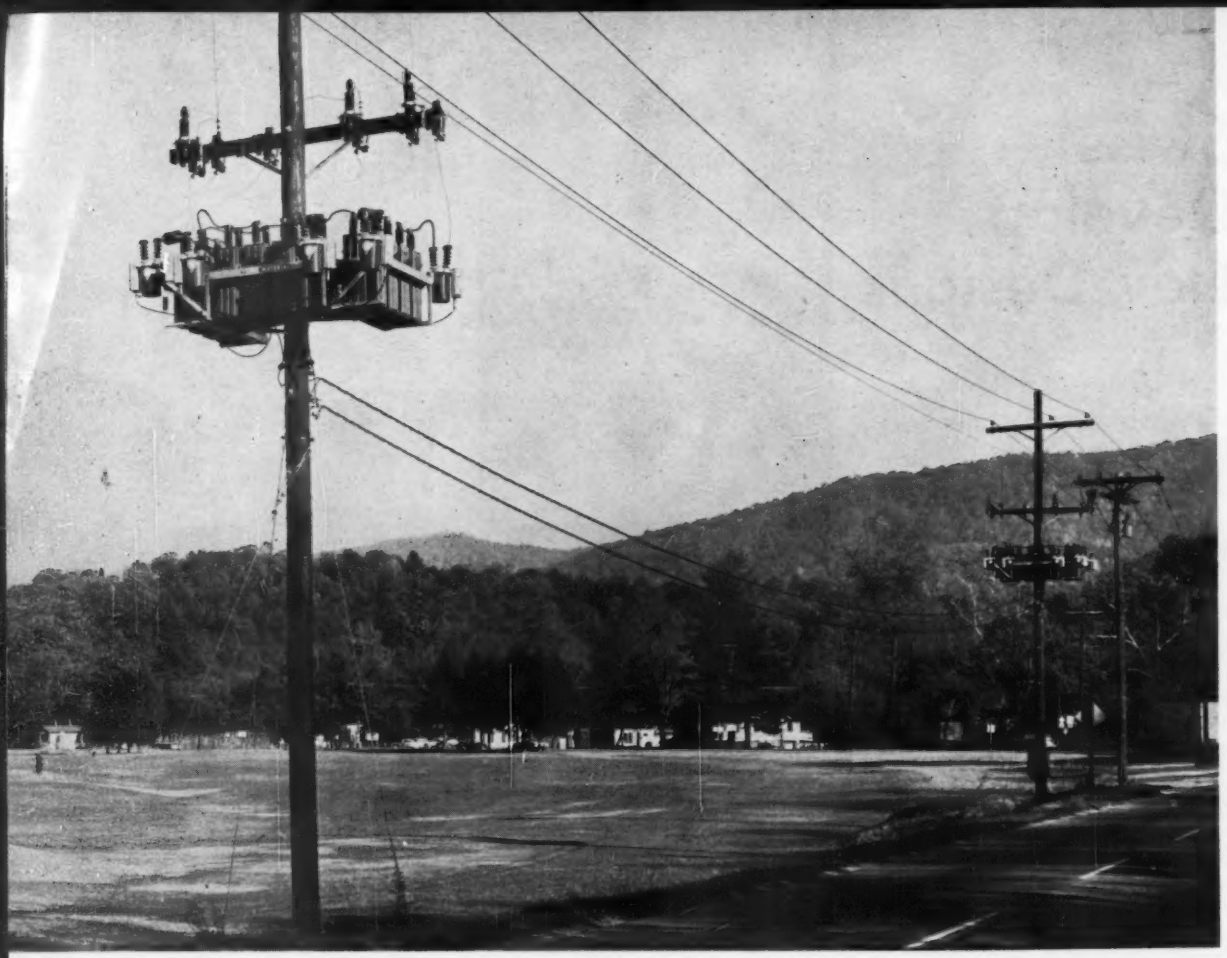
4. Compressed air tubes, control and lighting circuits are outside the high-voltage room and, hence, safe.

5. Indoor equipment and service building are on one floor and all 16-kv feeders are cables. Overhead lines start some distance away.

6. Remote control through high-frequency carrier is prevalent.

CONTROL ROOM at unattended substation has system diagram at right, glass-enclosed 16-kv CB's in rear room

AATHAL SUBSTATION, EKZ's newest, has 50 kv at left, at center 16-kv building and control room; at right, 150 kv



INSTALLATION consists of 24 100 kvar capacitors mounted as one bank on two adjacent poles. Carolina Power & Light Co installs such capacitor banks with provisions for their being switched on and off in four equal kvar steps

4-Step Capacitor Switching

Large bank with one current-compensated voltage control gives Carolina P&L versatile and economic installation

WAYNE BURCH, Engineer, Carolina Power & Light Co, Raleigh, N. C.

As the application of capacitors has broadened, it has become necessary for a greater percentage of those installed to be switched. In 1960, 53% of the capacitors installed on the Carolina Power & Light Co system were equipped for switching on and off.

For matching switched capacitor banks to the loading conditions on lines, switching has been of the voltage-control type. One major difficulty of voltage controls for switching capacitors has been the unsuitability of plain voltage control in many places where change in voltage level from peak to light load is small. The addition of current compensation raises the cost too high and complicates installation, and maintenance.

To overcome this problem, Carolina P&L installed a large capacitor bank which is switched in four steps with one current-compensated voltage control. The installation, on a 12-kv feeder near Ashville, N. C., consists of 24 100-kvar, 7,200-v capacitors in four banks of 600 kvar each. Two banks of capacitors are mounted in each of two cluster racks on two adjacent poles.

A set of 40-microhenry choke coils is connected in the leads of one bank in each cluster rack to limit surge currents between the two banks in each cluster. The span of primary has enough impedance satisfactorily to limit surge currents between the two structures. Each bank is wye connected, the neutral being solidly grounded.

A single voltage control, with current compensation (resistance only), switches the bank in four steps. The control is on one of the poles about 5 ft above ground and is connected by a cable to the two sets of switches also on the structure. Control connections to the two sets of switches on the adjacent structure are extended across the

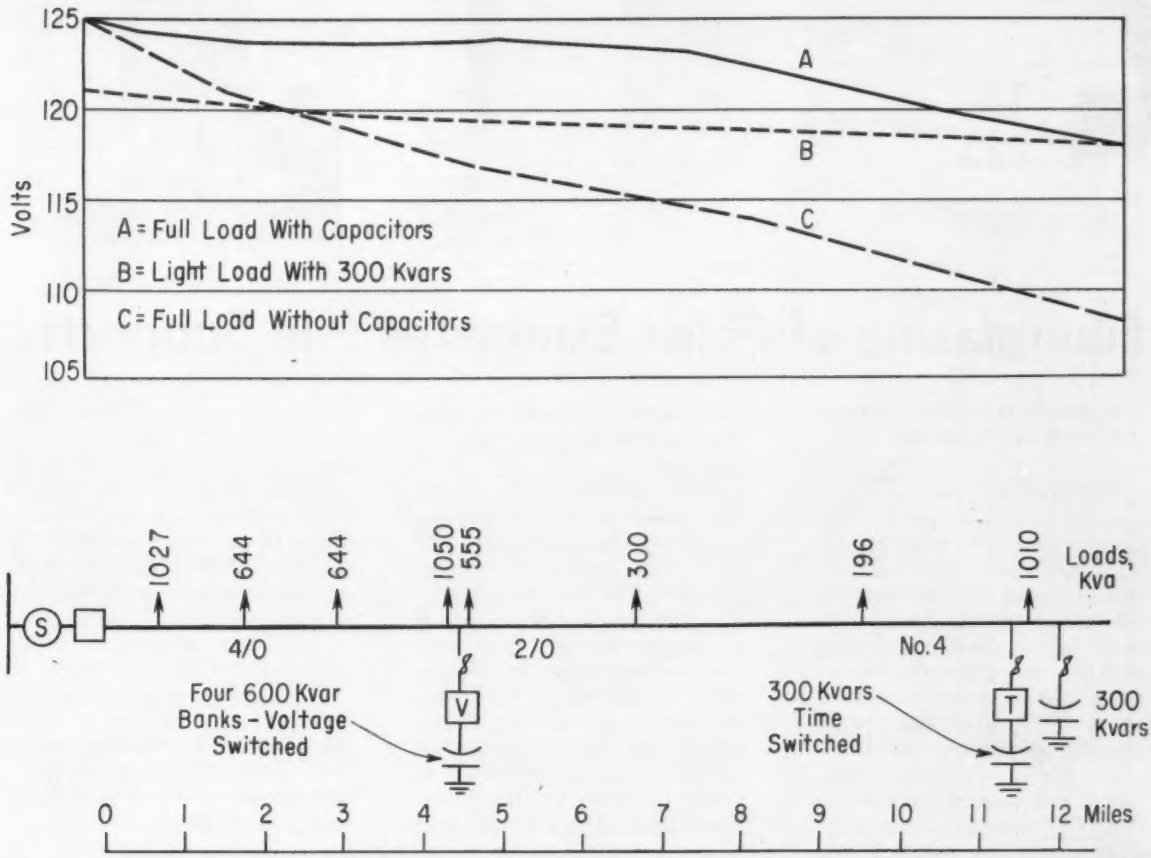


FIG. 1—CALCULATED VOLTAGE PROFILE for such a capacitor bank shows effect on the system voltage under the different conditions of load and distance and for the different amount in kvar of capacity in service on the system

Improves Voltage Control

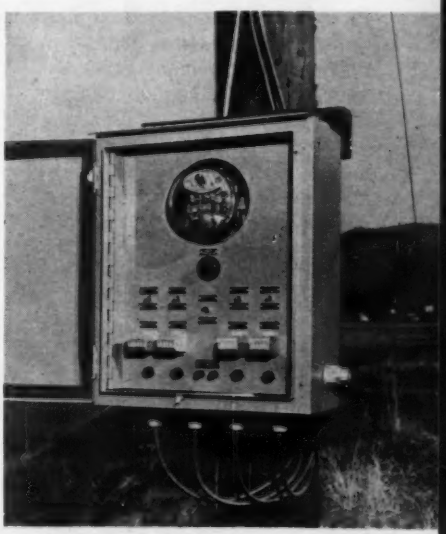
span by two triplex service cables.

The capacitor bank is about 4.5 miles from the substation. One 3-phase branch line is extended 7 miles beyond this point to supply a load of about 1,500 kvar. As the 2,400-kvar bank did not provide satisfactory voltage to the end of this tap, 300 kvar of unswitched capacitors and 300 kvar of time-switched capacitors were added at the end of the feeder.

The calculated voltage profile from the substation to the end of this branch line is shown in Fig. 1 for peak load with all capacitors in service, for light load with 300 kvars of unswitched capacitors only, and for peak load with no capacitors. After installation of the switched capacitors, voltages along the line were substantially the same as the calculated values.

Although controls for the installation are not as simple as might be desired, they have operated very satisfactorily for about eight months. No trouble has been experienced except the loss of one timing relay. Because of the size of the capacitor bank, the controls are inspected more often than controls on smaller banks. But it is not anticipated that their maintenance will require as much time or expense as four similar controls on 600 kvar banks.

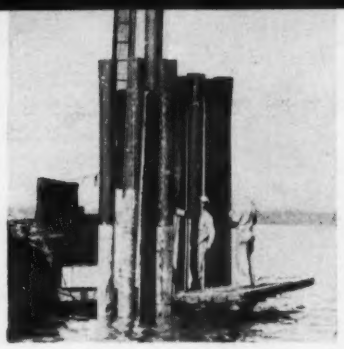
Installation cost per kvar is comparable to that of four separate 600-kvar banks with time switch controls and is considerably less than the cost of four such banks with individual current controls.



VOLTAGE CONTROL, with current compensation, is mounted 5 ft above ground and connected to two switches above and two on adjacent pole

ELECTRIC UTILITY METHODS

CONSTRUCTION



Fiberglasing of Poles Eliminates Pile Supports

H. D. MANTZ JR, Proj Eng'r, Florida Power & Light Co, Miami, Fla.

Fiberglas wrapping is being used by Florida Power & Light Co to protect wood poles that are set in salt water from attacks by marine borers. By installing the Fiberglas-protected poles directly in the water, rather than atop the more expensive conventional pile-supported structures, about $1,500 to $2,000 per H-frame structure can be saved.

In the conventional "salt-water" transmission line installation, 12-lb-per-cu-ft creosote retention poles are mounted atop 22-lb creosote retention support piles. This type of construction is extremely expensive.

Examination of a five-year old Fiberglas-wrapped pole, removed from a salt-water installation at Ft Pierce last year, showed a minimum of marine-borer damage to only one of the many poles examined — the actual damage noted was attributed to faulty wrapping and sealing techniques rather than to any protective inadequacy of the Fiberglas. Accordingly, when a new transmission line was required in the Cocoa, Fla., area, pole-Fiberglasing was utilized.

The new line ran through water of varying depths, from City Point to Canaveral Station. In water depths up to 5 ft, Fiberglas-wrapped poles, without pile supports, were set directly into the river bottom. Beyond the 5-ft depth, unwrapped poles were supported clear of the water, atop Fiberglas-wrapped pile structures. The Fiberglasing, for both the poles and the piles, covered the total of their water-immersed surfaces, plus 3 ft above the water line and 2 ft below the river-bottom surface.

Three different methods (see box below) were developed for installing the Fiberglas in order that comparative experience could be gained for each.

To prevent damage to Fiberglased poles, rope slings were used when moving or loading poles. Rubber tires were used as dividers on pole trailers to protect the Fiberglasing during hauling. Linemen were not allowed to climb on the Fiberglased area. Any Fiberglas pole covering that was damaged by handling, or that had developed any bad spots, was repaired by cleaning the damaged area of any foreign matter, coating it with an application of resin, applying a Fiberglas cloth patch and again coating with resin while working out air bubbles and voids.

Poles were installed by water jetting to the required depth.

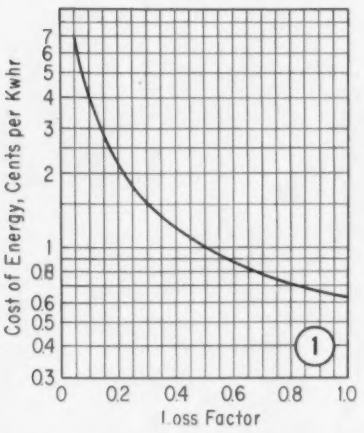
Fiberglasing of poles cost between 45¢ and $1 per sq ft of surface treated—including materials—depending on the method, the location of the pole storage, and number of poles.

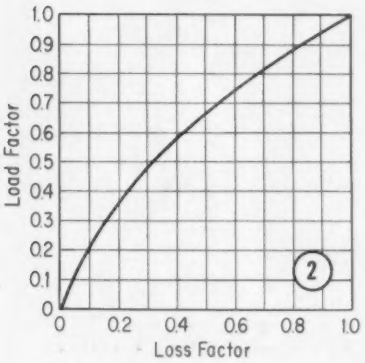
Three Methods for Fiberglasing Wood Poles

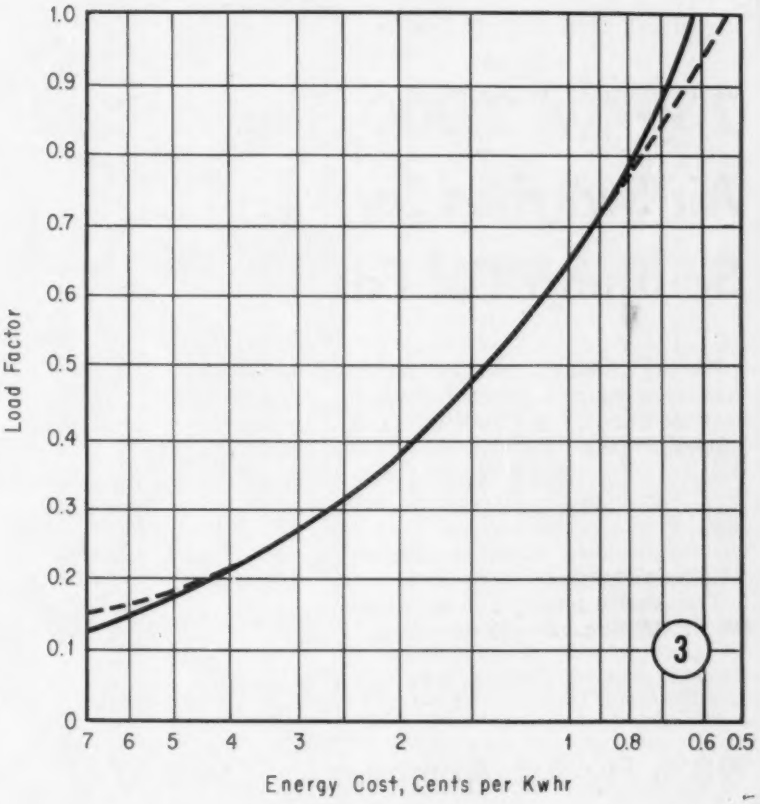
In-Place Method—Section of the creosoted pole to be Fiberglased is painted with aluminum paint to retard leaching of creosote. The aluminum paint is allowed to dry and a coat of thixotropic resin is next applied over the painted area. A 10-oz Fiberglas cloth is then wrapped over the area with sufficient overlap to eliminate weak spots. A second layer of resin is then applied and allowed to dry. Third layer of resin is next applied, taking care to completely seal the weave in the cloth and cover any voids or air bubbles. Finally, the seam of the cloth running vertically on the pole, as well as the treated pole-end, is nailed with copper roofing nails about every 4 in. to completely bond the Fiberglas "shield" to the pole.

Precast Method — Fiberglas shield is precast on a mandril, either in the workshop or elsewhere. The shield is formed on the mandril just as on the pole in the "In-Place Method," except painting is eliminated. After forming, shield is cut lengthwise from mandril and hauled to job site where it is wrapped snug around pole with about a 4-in. overlap, machine-banding same about every 3 ft. Shield is then nailed down the seam of the overlap and on end circumferences. Seam and end circumferences are then sealed with resin.

Spiral Method—Area to be Fiberglased is first spirally wrapped with cellophane, overlapping each spiral. The cellophane replaces the aluminum paint used in the "In-Place Method." A layer of resin is then applied over the cellophane. With resin still wet, Fiberglas cloth is spirally wrapped, with a 2 to 5-in. overlap for strength, followed by second layer of resin. After second coat of resin dries, third layer of resin is applied, taking care to seal weave of Fiberglas cloth completely. Voids or air bubbles must be worked out of the resin.







Find Energy Cost From Feeder Load Factor

R. A. DEWBERRY, Electrical Engineer, Montana-Dakota Utilities Co, Minneapolis, Minn.

The cost of energy on a distribution feeder can be determined readily if the cost is taken as a function of the feeder's load factor rather than its loss factor. This article presents the graphical solution of the relation between energy cost and feeder load factor.

The relation between the cost of energy, C, and loss factor, as given in the *Distribution Data Book,* General Electric Co, is shown in Fig 1. A relation between loss and load factors on a distribution feeder from B. G. A. Skrotzski's *Electric Transmission and Distribution,* 1954, p 406, is given by the equation, Loss Factor $= 0.7\ LF^2 + 0.3\ LF$, where LF is load factor. A plot of this equation is shown in Fig 2.

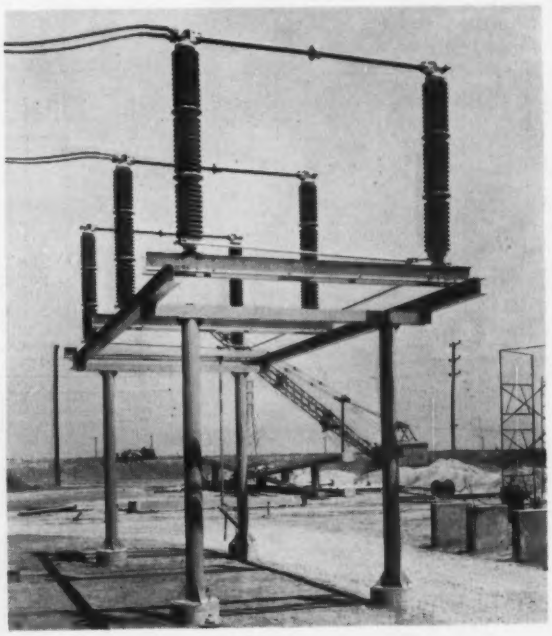
Because the load factor of a feeder is a little more readily determined than the loss factor, it is desirable to get the relation between load factor and energy cost. By taking loss factors from Fig 2 for various load factors and then getting the corresponding energy costs for these loss factors from Fig 1, we can graphically show the energy cost for any load factor. A representative group of associated values is listed in the table. By plotting these values against each other, the solid curve in Fig 3 is developed.

This curve suggests a relation between energy cost and load factor in the form of the equation, $C = (k/LF)^n$, where k and n are constants and C is in dollars per kwhr. An approximate solution for these constants gives $k = 0.02$ and $n = 1.33$. This equation may be used with good accuracy for load factors between 0.2 and 0.8. Below and above these load factors, the equation yields the dotted line shown.

Load Factor vs Energy Cost

Load Factor	Loss Factor	Energy Cost, ¢ per Kwhr
0.13	0.05	7.0
0.3	0.153	2.7
0.5	0.325	1.45
0.7	0.553	0.94
0.9	0.837	0.69
1.0	1.0	0.63

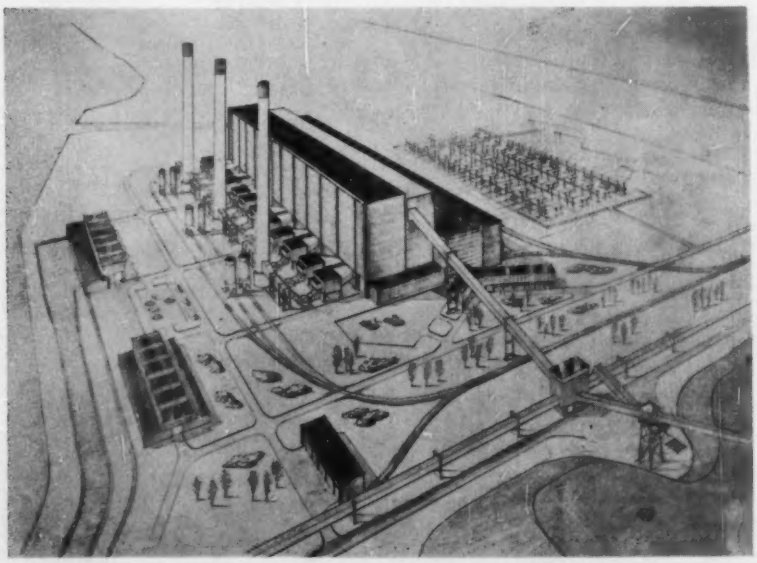
230-Kv, 2,000-Amp Air Switches for Southern Cal Ed



Twenty 230-kv, 2,000-amp center side-break disconnecting switches are currently being manufactured by Cole Electric Co, Culver City, Calif., for Southern California Edison Co's Alamitos Steam Station. The switches are rated 1,050-kv BIL, 70,000-amp momentary. Eight of the 20 switches manufactured were supplied with ground switches. Both the main switches and the grounding switches are manually operated, using 180-deg lever-type operating mechanisms. Special terminal pads were furnished to accommodate two 1,590-MCM, ACSR conductors per phase.

98% Fly-Ash Removal for Ontario's 1,800-Mw Steam Plant

One of the world's largest steam-electric generating plants, Ontario Hydro-Electric Power Commission's huge Lakeview Project, due to start delivering power this year, will be equipped to remove at least 98% of the fly-ash particles from boiler gases. A contract to provide four electrical precipitators for Units No. 3 and No. 4 of the six-unit project has been awarded to Research-Cottrell (Canada) Ltd (a subsidiary of Research-Cottrell, Inc, US manufacturer of industrial gas-cleaning equipment).

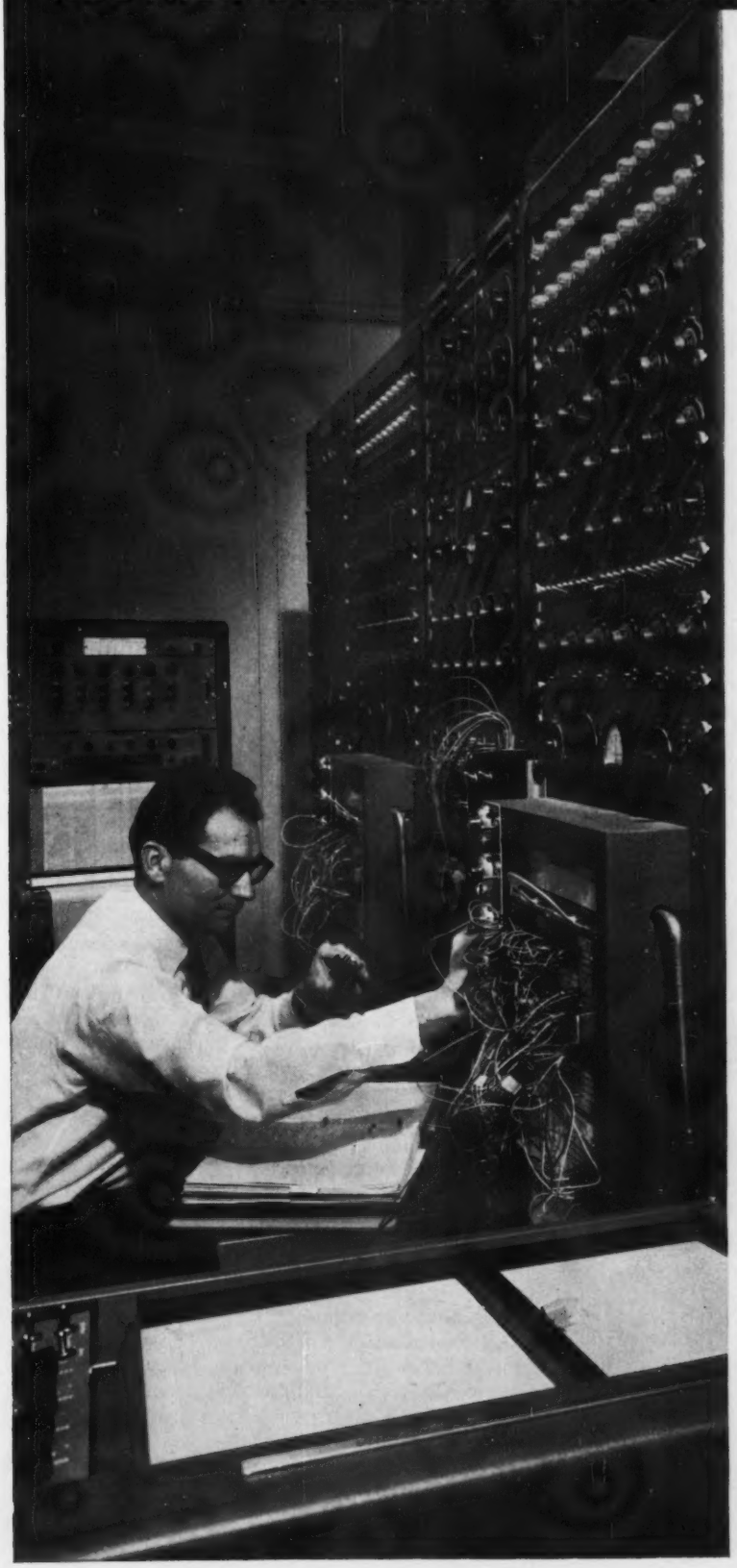


PRECIPITATORS will clean 1,600,000 cu ft per min of boiler-exhaust gases at Ontario Hydro's Lakeview Plant with a guaranteed efficiency of 98%

The large steam plant reportedly will have the largest single-furnace boilers installed in Canada—capable of producing 2 million lb of steam per hour at 2,350 psig at the turbine, with superheat and reheat temperatures of 1,000F. The precipitators will clean 1,600,000 cu ft per min of boiler-exhaust gases with a guaranteed efficiency of 98%. These Cottrell precipitators use an electric field of force to pull submicroscopic dust and particles from the gas stream. Power will be generated by 300-Mw turbine generators of the cross-compound and tandem-compound types. Cost of the huge power project designed and constructed by Ontario Hydro is estimated at $250 million.

(*More Manufacturers News, p* 52)

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



COMPUTER STUDIES BY GENERAL ELECTRIC PROVE . . .

Reduced Regulator Bandwidths Increase System Earnings

General Electric voltage regulators provide three added benefits to distribution systems through bandwidth reduction . . . extra feeder length, capacity, and revenue! New G-E computer studies now prove that *reduced regulator bandwidths are practical* and that they result in increased distribution system performance with *no sacrifice of regulator life.*

Electric utilities have long recognized the desirability of bandwidths as low as ±¾ volts. The assumed stumbling block was the number of regulator operations. Through analysis of actual (as opposed to theoretical) data, these studies indicate that bandwidths of ±¾ volts are feasible from any standpoint, including that of equipment life.

Your General Electric regulator representative can show you the specific effects of reduced bandwidths on regulator operation. He will show you how to determine if operations must be controlled . . . and if so, how to control them.

And he will illustrate how these reduced bandwidths can now be easily set with G.E.'s exclusive new Micro-Band* voltage regulating relay —the first to offer you *calibrated adjustment* of both voltage level *and* bandwidth.

Micro-Band relays make possible more *usable* kva on the line. This easily attainable "power adder" can mean increased line length and capacity—important tools to increase feeder revenue.

To increase the return on your regulator investment—possibly with your existing equipment—get the full story on Micro-Band calibrated relays and reduced bandwidths from your G-E Sales Engineer. General Electric Co., Schenectady 5, N. Y. 456-02A

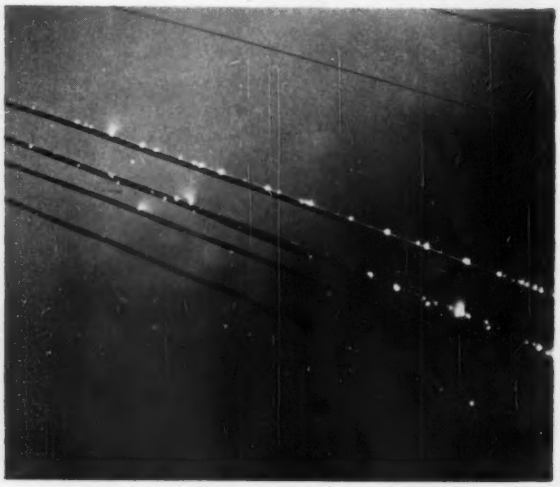
* Trade-mark of the General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Corona-Free Connectors Proved Out

• T&B's 1.6-in. cable connectors tested corona-free to 1,000 kv phase-to-phase



EXCESSIVE LINE CORONA is evidenced, with little on connector, during Apple Grove 1,000-kv phase-to-phase tests

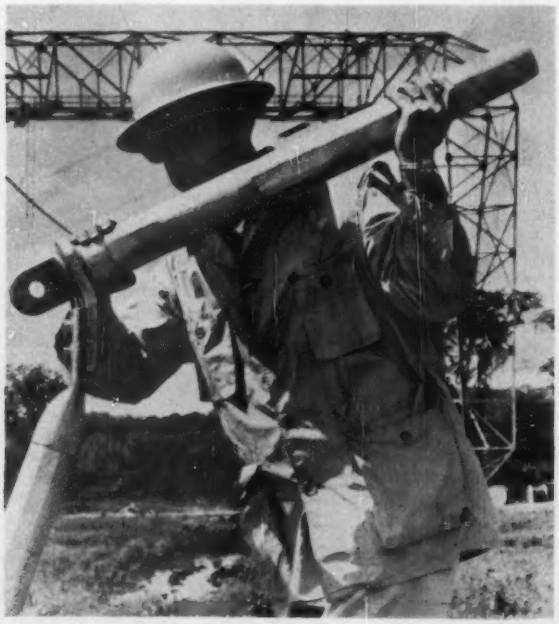
Tests up to 1,000 kv phase-to-phase, using a four-conductor bundle of 1.6-in.-dia cable, reportedly have shown that corona in the extra-high-voltage transmission connectors developed and manufactured by Thomas & Betts Co, can be reduced to a minimum approaching zero. The connectors are said to have been designed to exceed the strength, conductivity and corona characteristics of cables. As a result of preliminary findings at Apple Grove, T&B engineers are incorporating tapered shapes for connector ends in their standard line.

In the research program continuing at the Apple Grove test facility in West Virginia, a variety of T&B extra-high-voltage, compression-type cable accessories are being subjected to numerous types of operational tests.

Earlier tests at the 750-kv power transmission test site indicated that cable-end corona-suppressing devices were no longer required for satisfactory performance of T&B splices, tap connectors, terminals and deadend bodies.

• Alcoa's deadend assembly for 2.32-in. ACSR reported corona-free at 500 kv

A 500-kv deadend assembly has been removed from the lines of General Electric Co's Project EHV prototype transmission system, following successful completion of testings on a special 2.32-in.-dia expanded ACSR, developed by Aluminum Co of America.



DEADEND ASSEMBLY for 2.32-in. dia expanded ACSR is removed from Project EHV after corona-free 500-kv tests

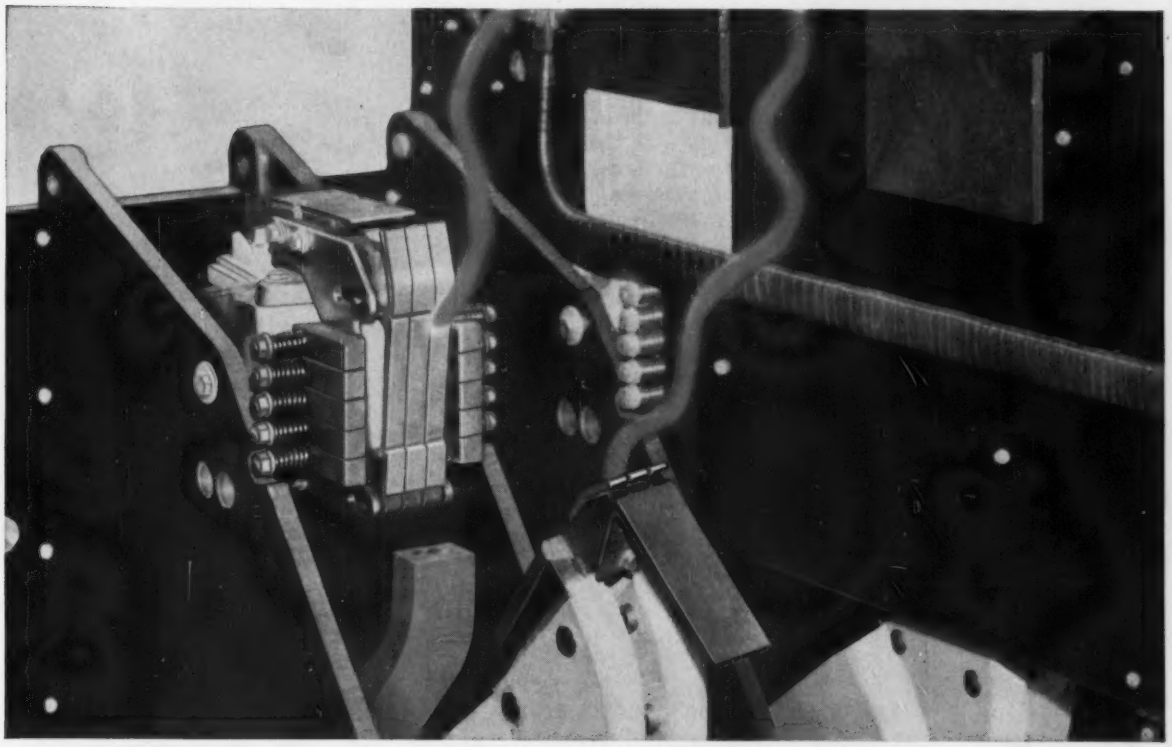
The deadend and jumper terminal were developed for use with this large-diameter conductor operating in the 460 to 500-kv range, by the accessory design department of Alcoa's Rome Cable Division. Standards met by the design included corona-free operation at 500 kv, ability to match the 80,000-lb rated ultimate strength of the conductor when installed, and electrical equivalence to the conductor itself. While not the largest deadend developed by Alcoa, since larger ones have been devised to meet unique river crossing circumstances, it is the largest ever manufactured for normal overhead transmission purposes.

Twelve of the large deadends were employed during tests on the Project EHV line. Fabricated of wrought aluminum alloy, incorporating an 11½-lb steel eye in the 33-in.-long deadend, the assembly contains over 24 lb of aluminum in deadend barrel and pad, and in the 24-in.-long jumper terminal. Design includes a special high-voltage end, machined to shape to eliminate corona discharge points.

All Project EHV conductor and conductor accessories, smaller sizes for bundling, as well as the king-sized versions were supplied by Alcoa's Rome Cable Division. The company's Alcoa structural division also is reported to have made major contributions to the project, which recently energized its line briefly at a record 770 kv (EW, June 26, p 64).

(*Manufacturers Briefs on page* 74)

ALLIS-CHALMERS



Full protection at 1 million kva

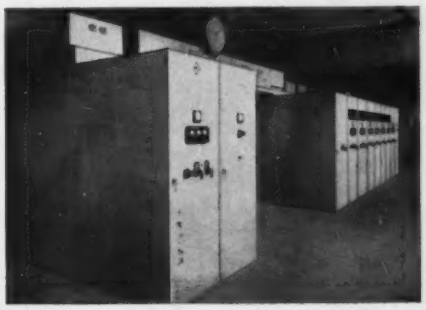
with this 15-kv maximum reliability metal-clad switchgear

New interrupting capability — 1,000,000 kva and below with *Ruptair* magnetic air circuit breaker in A-C 15-kv switchgear, means complete system and personnel safety.

Here are the *Full Protection* facts:

- Maximum reliability assured . . . insulation designed and tested to give utmost dielectric integrity.
- Breaker tested *in the unit* at *full* three-phase rating and beyond.
- Dead-front construction...the only self-locking front protective barrier.
- 3 hinges and 3 knurled screws strongly secure the front panel.
- *The ONLY switchgear with a front barrier and a front panel.*
- Front accessible current transformers can be inspected, maintained, replaced without exposure to any high voltage compartment.
- Enclosed service aisleway provided in the outdoor *Shelter-Clad* switchgear.
- Entire front panel can be used for meters and relays. Both stored energy and solenoid operators are available in a complete line of 5 and 15-kv switchgear. Simply installed, easily maintained, this new 15-kv switchgear now serves utilities, refineries, steel plants, and institutions. For product details, call, wire or write your nearby A-C office. A-1523

Tilted front steel barrier locks with cubicle to protect operator.

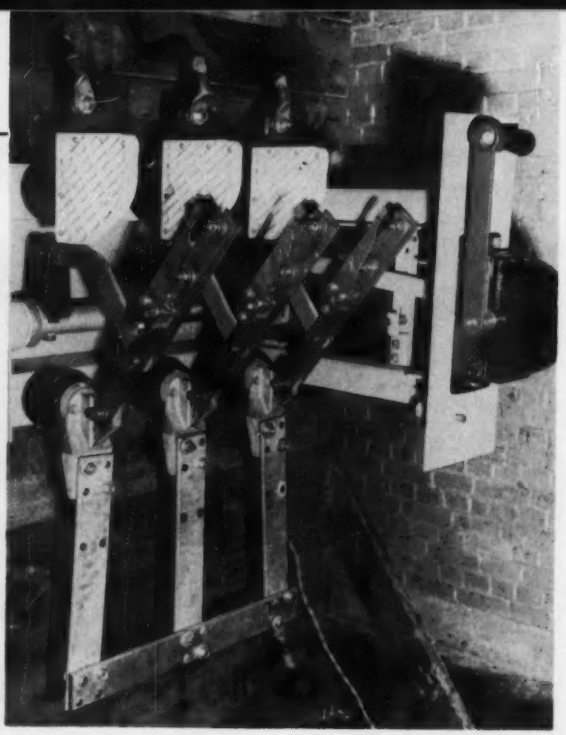


15-kv indoor metal-clad switchgear installed in a western utility.

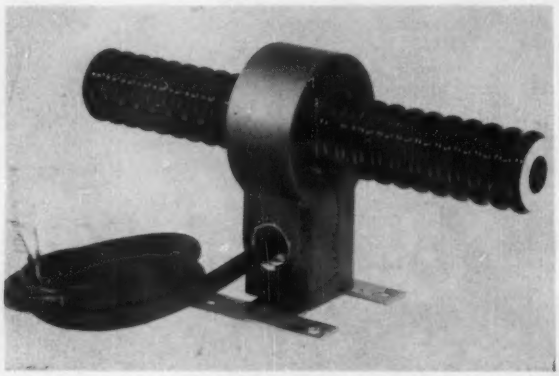
Ruptair and *Shelter-Clad* are Allis-Chalmers trademarks.

New Equipment

Load-Break Switch . . .



. . . in 5, 7.2 and 14.4 kv, features fault closing of 60,000 amp at 5 kv and of 40,000 amp at 14.4 kv. The LBF-2 line opens 600 or 1,200-amp load current at 80% power factor and handles transformer magnetizing current in addition to small capacitive currents. At 600 amp, interrupting life at 5 kv is 500 operations, and at 14.4 kv it is 100 operations. At 1,200 amp, operating life is 20 interruptions before maintenance is required. The interrupter is a unitized assembly of pole units, mounting frame, spring operating mechanism and operating handle. Interphase barriers are normally a part of the assembly. The unitized assembly may be mounted in its own enclosure or readily incorporated in a metal-clad switchgear.
Westinghouse Electric Corp, Pittsburgh 30, Pa.

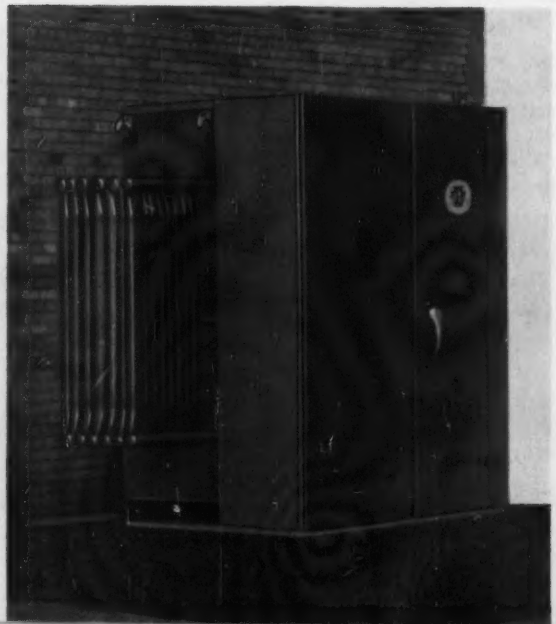


Current Transformer . . .

. . . 15 kv, is through-type for outdoor use. Type V-150 is said to be ideally suited for use with system measurement meters and for capacitor-switching control instruments, because it is accurate within 2%. It is available in 200:5 and 100:5 ratios. The transformer is molded in epoxy and fitted with a porcelain bushing which will handle conductors up to 15/16-in. dia. Each unit is furnished with 5 ft of type SO 12/2 secondary lead; the secondary outlet is fitted with a 1-in., threaded bushing for conduit connections. Type V-150 is color-coded for quick identification.
Sangamo Electric Co, Springfield, Ill.

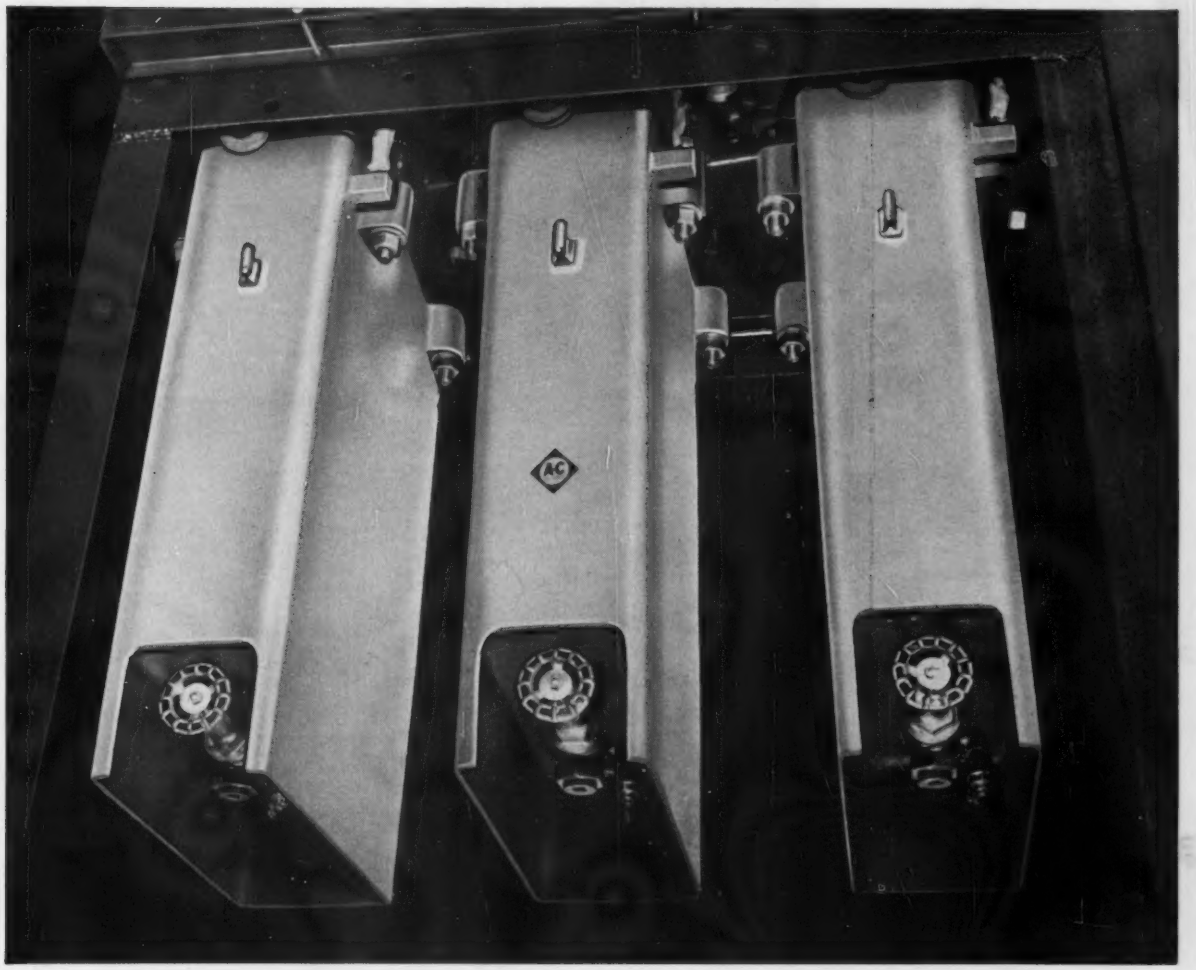
3-Phase Power Center . . .

. . . is designed for use with underground primary feeders and permits elimination of fences and overhead structures, obviates the expense of underground vaults. Size of units range from 750 through 2,500 kva—15 kv and below. The standard Power Supply Center includes a 55C-rise, oil-immersed, load-center transformer with standard load-center accessories. Terminal compartments with hinged doors are provided for both high and low-voltage connections. All live parts are enclosed in the weatherproof, tamperproof compartments, which may be padlocked. Primary cable entrance is from underground, with either top or bottom cable entrance on the secondary. Optional accessories which may be ordered include provisions for secondary bus-duct entrance, potheads, fuses, lightning arresters and metering equipment.
Pennsylvania Transformer Division, McGraw-Edison Co, Box 330, Canonsburg, Pa.



(More New Equipment, page 58)

ALLIS-CHALMERS



Absolute phase isolation

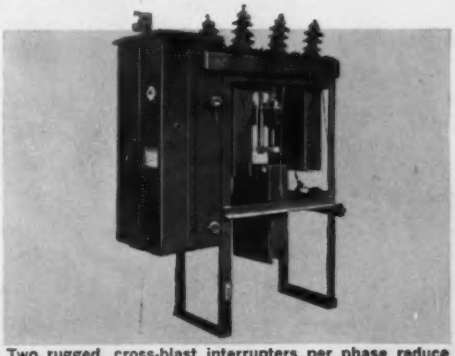
...available on 14.4 and 23-kv outdoor distribution breakers!

Three-tank construction is a must for transmission circuit breakers to prevent phase-to-phase flashover. A-C gives you this same positive-protection, three-tank construction in 14.4 and 23-kv breakers.

Allis-Chalmers breaker protection extends even further! Each tank is lined with high dielectric insulation. Liners are nonbuckling, nonwarping.

Three-tank design cuts oil contamination and maintenance, since only the faulted phase is affected. And new Type LO cross-blast interrupters (250 and 500 mva) minimize oil contamination even further by reducing interrupting time to *5 cycles* over the *entire* range of interrupting currents (up to 25,000 amps).

Type OZ breakers are available in 600 and 1200-ampere continuous-current ratings. Your nearby A-C office can give you full details, or request Bulletin 71B9705 from **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1425



Two rugged, cross-blast interrupters per phase reduce arcing time to less than 5 cycles — sharply cut oil contamination.

IN NEW Wagner®

LIVE BETTER ELECTRICALLY

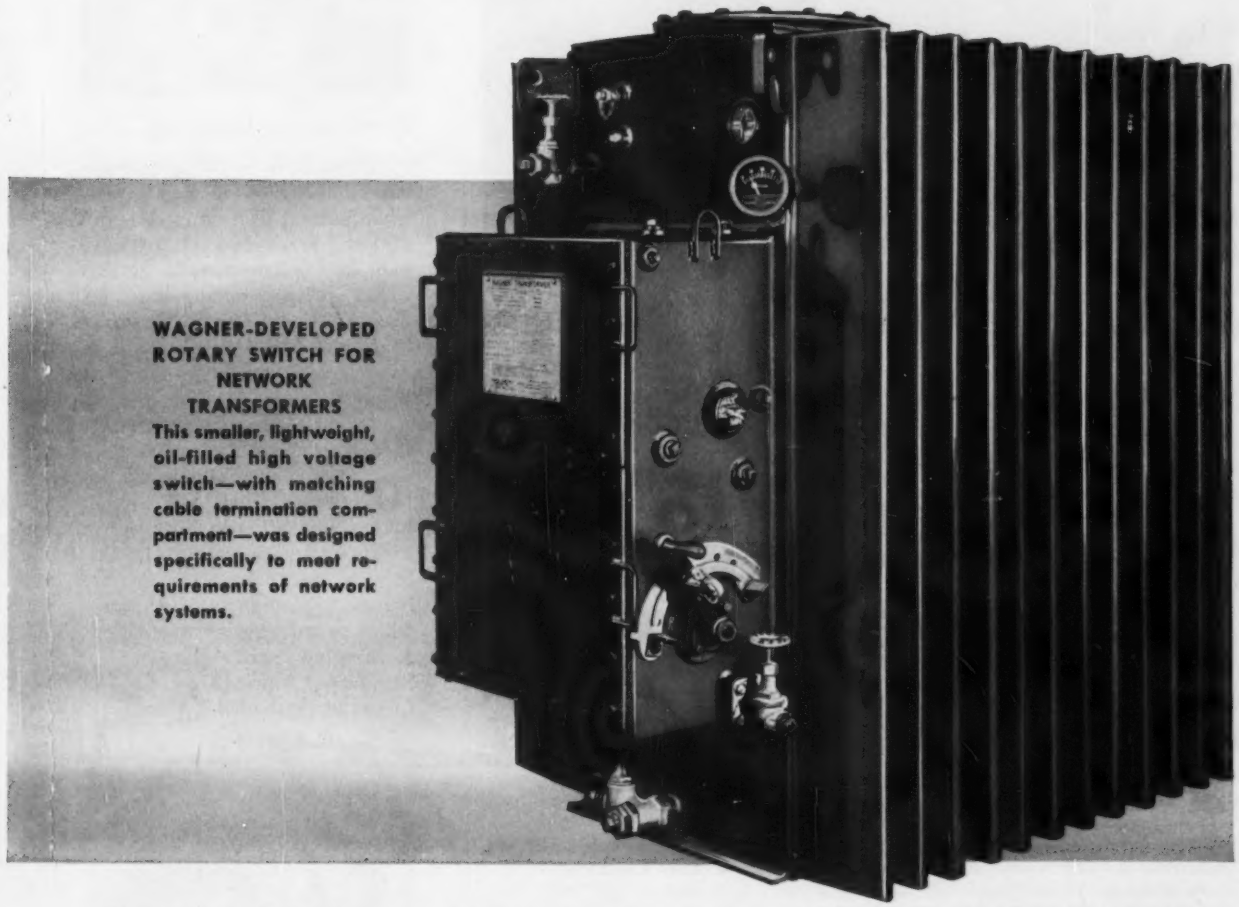
SIX 2000 KVA WAGNER NETWORK TRANSFORMERS installed on the system of Dallas Power and Light Company serve the Southland Center. The 42-story Southland Life Tower and the 600-room Sheraton-Dallas Hotel consume an enormous amount of power . . . power used, for example, by 15,800 lighting fixtures, 28 elevators, 8 escalators, an all-electric company cafeteria, and a 6,450 ton electrically-driven air conditioning system.

SERVING 2 GREAT GROWTH INDUSTRIES
. . . ELECTRICAL
. . . AUTOMOTIVE

NETWORK SYSTEMS... or OLD

Network Transformers

will fit in close quarters... are small in size... have compact rotary switch... modern, corrugated cooling surfaces



WAGNER-DEVELOPED ROTARY SWITCH FOR NETWORK TRANSFORMERS
This smaller, lightweight, oil-filled high voltage switch—with matching cable termination compartment—was designed specifically to meet requirements of network systems.

Wagner® Network Transformers are designed to give you smaller, lighter units, with smoother contours for easier maintenance. In new networks you can cut system costs by constructing smaller vaults to hold these space-saving transformers. In older systems you can put larger ratings in your present vaults. Maintenance costs are less, too. The corrugated radiators can be quickly cleaned from above, and an anti-corrosive tank finish protects exterior surfaces for years. A special undercoating on the base protects the transformer even under adverse conditions of underground installation.

CORRUGATED TANK-COOLING SURFACES eliminate dirt-catching corners. Radiating surfaces are easy to clean, and there are no hard-to-get-at spots to hinder painting when it's needed. Reliability is improved because there are fewer places for leaks to develop.

LOWER NOISE LEVEL has resulted from improvements in core design and materials, and newly developed methods of annealing the core steel. Lower noise levels are a feature of all Wagner transformers.

Over 65 years of constant research and development have made Wagner a leader in transformer design... made the Wagner name one of the foremost in power planning. For expert advice in solving your network transformer problems, consult your nearby Wagner Sales Engineer. There are Wagner branches in 32 principal cities.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MO., U.S.A.

WT61-7

RELIABILITY

C&D unitized power pack increases switchgear reliability!

Utilities and industrial plants can greatly increase their reliability and protection for switchgear and control equipment by using C & D's *AutoCal** unitized Power-Pack.

Here's a dependable, high-capacity power package specifically built for tripping and control. It pairs a simple, compact, C & D *AutoReg*® silicon charger with powerful C & D PlastiCal® (lead-calcium grid) control batteries.

The charger is a completely automatic, constant voltage, current limiting type. It is automatically compensated to operate over an input range with a variation of ±10%, without the use of voltage or current sensitive relays. There are no special sensing circuits incorporating Zener diodes and transistorized elements. The charger has only two basic parts—a constant voltage, current limiting transformer and a silicon diode rectifier—thus assuring greater reliability.

PlastiCal batteries have extra-thick positive plates (0.266"). They provide a high one minute rate and only require 1/5 to 1/10 as much current to maintain a fully charged condition as do conventional batteries. Consequently, there is so little electrolysis of water that PlastiCals need be watered only once a year.

The combination of a C & D *AutoReg* charger and PlastiCal battery gives you self-protected charging, instantaneous peak power, and long trouble-free life.

Get the full details—write for Bulletin AR-102 today!

MOUNTINGS

Cubicle Mounting.

Relay Rack Mounting for standard 19" relay rack.

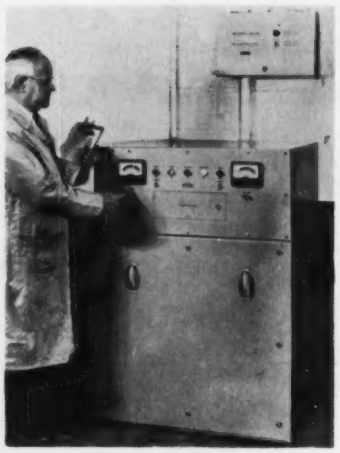
Weather-Proof Outdoor Mounting. Both charger and batteries fit in a weather-proof cabinet.

Wall Mounting.

C & D BATTERIES
of Conshohocken, Pa.
DIV THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell® and PlastiCal® Batteries for Communications, Control, and Auxiliary Power • Producers of AutoReg® Silicon Chargers and AutoCal® Charger-Battery Combinations

®Trademark, C & D Batteries Div. The Electric Autolite Co.



Emergency Lighting . . .

. . . two 32-v systems, operates automatically and instantaneously when normal lighting fails. Series 100 and Series 200 systems have built-in "supervisory" circuits which report immediately any disarrangement in the systems—even to a burned-out bulb in an exit sign. Power is provided by Flexlab nickel-cadmium batteries which maintain their useful life for 25 yr or more; these are non-acid. They can be fully discharged and recharged repeatedly without harm; are safe (do not gas on trickle charge); require addition of water only once a year and are housed in permanent plastic cases which permit viewing water level. Recharging is automatic.
Standard Electric Time Co, 89 Logan St, Springfield, Mass.

Event Recorder . . .

. . . inkless, uses electrically heated, stainless-steel styluses which, during torture tests, re-

tained resonse speed of 1/20 of a sec. The 620 Event Recorder with Tempen styluses is available in a 10-channel or a 20-channel model. Power to heat the styluses can be obtained from a 120-v, 50 to 60-cycle source or from a 12-v storage battery. The special chart paper has a non-wax finish which eliminates the danger of marred records caused by external heat, rough handling or discoloration from sun and other strong light. An easily accessible rheostat can be set to control the width of lines made by the styluses. The recorder is reportedly useful for studies of circuit breaker action, also for time studies.

Esterline Angus Instrument Co, Inc, Box 596, Indianapolis 6, Ind.

Ultrasonic Cleaner . . .

. . . features a combination of operating frequencies which are said to bring about a degree of cleanliness unobtainable with a single frequency. Poly-Sonic V-100 also is said to provide thorough cleaning because it produces uniform concentration of ultrasonic power throughout the cleaning chamber. Heated solutions are used for more effectiveness. V-100 runs at 400 kc with overtones of other frequencies ranging down to 20 kc. At 400 kc, dirt particles down to 1 μ in size are removed and small crevices and recesses penetrated. Lower frequencies provide cleaning action required for larger dirt particles and provide cleaning of areas not accessible to high frequency because of shadowing. Cleaning container is stainless steel tank with stainless steel cover.

McKenna Laboratories, 2503 Main St, Santa Monica, Calif.

(*Continued on page* 61)

Watthour meters are designed to do their job indefinitely. But occasionally repair may be required . . . a truck grazes the meter . . . a rock breaks the cover and dents the register . . . the meter is dropped, the disk bent. Whatever the cause, Sangamo sectionalized construction enables quick, easy, inexpensive repair.

Any major J3 component can be inspected or repaired without completely disassembling the meter or returning it to the manufacturer. There is no paper work delay; the meter is back in service quickly . . . reducing meter stocks.

Parts inventory? Kept to a minimum: all major J3 components (except frame and moving system) are interchangeable with the J2. You can even install J3 magnetic flotation on J2 meters. The economies of sectionalized construction are realized immediately when you standardize on the J3 . . . unsurpassed in metering values.

true MAGNETIC flotation J3

SANGAMO ELECTRIC COMPANY

SPRINGFIELD ILLINOIS

PW61-9

13-50

Low Cost Computer for Power Stations

A sophisticated low-priced control computer with capabilities ranging from simple logging to closed-loop control, the TRW-330 brings you a new standard in flexibility. You can start with a small basic system that matches your current requirements and then add capabilities as you need them.

Thompson Ramo Wooldridge has successfully installed more digital control computers than any other manufacturer. Because TRW-330 design is based on this experience, you are assured that a TRW-330 system offers the greatest value per dollar in computer hardware – in flexibility, reliability, efficiency.

TRW-330 FLEXIBILITY – Memory sizes range from 4,000 to over 100,000 words; analog input capacity from 0 to over 1,000; an optional subsystem permits automatic scanning and alarm functions to proceed independently of the computer's control program. A similar degree of flexibility is afforded by the TRW-330's analog-output system, priority interrupt circuits, digital input-output equipment, fast-access storage, and command structure.

TRW-330's are supplied in cabinets that match the application: rugged cabinets for harsh industrial environment, air purgable cabinets for hazardous environment, or standard control-room cabinets.

TRW-330 CAPABILITIES – TRW-330 computing speeds exceed those of competitively priced machines; addition instructions can be performed in 260 microseconds, including access time.

TRW Computers Company

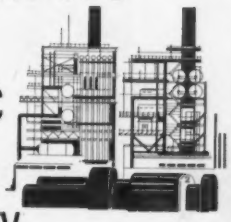
a division of **Thompson Ramo Wooldridge Inc.**

TO FIND OUT HOW THE TRW-330 CAN BE APPLIED TO YOUR CONTROL PROBLEM, CONTACT ANY OF THE TRW COMPUTERS COMPANY OFFICES LISTED BELOW.

220 North Canon Drive	1510 Esperson Building	200 East 42nd Street	200 South Michigan Avenue	3272 Peachtree Road, N.E.
BEVERLY HILLS, CALIFORNIA	HOUSTON, TEXAS	NEW YORK 17, NEW YORK	CHICAGO, ILLINOIS	ATLANTA 5, GEORGIA

The TRW-330 in the electric power industry

13-68



TRW computer systems are accepted by the industry: 2,000 megawatts will soon be controlled by Thompson Ramo Wooldridge systems. In all, nine TRW computer systems are being supplied to the electric power industry in the U. S. and abroad.

The largest installation will be the TVA Paradise Station near Drakesboro, Kentucky. Two TRW-330's will control two 650-megawatt generating units. Each computer will control its generating unit through startup, operation, and shut down. The TRW-330's will perform sequencing operations and sequence monitoring, make performance calculations, log data, perform sensor scanning and alarm monitoring, and will supply signals for trend recording.

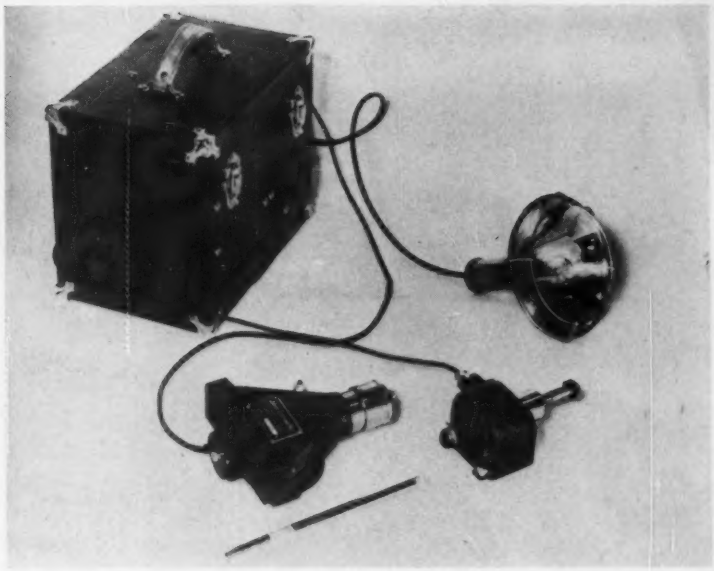
For electric generating units in the 25 to 100 megawatt range Thompson Ramo Wooldridge has developed a standard-package digital computer control system called MULE—for Medium Utility Logger-Economizer. Using the TRW-330, the MULE system takes advantage of standardized project engineering and computer programming to keep costs within the reach of the medium-sized utilities.

The experience of Thompson Ramo Wooldridge is your guarantee in both hardware and systems engineering. Investigate the TRW-330 in the light of your own requirements today.

TRW Computers Company

a division of Thompson Ramo Wooldridge Inc.

8433 FALLBROOK AVENUE, CANOGA PARK, CALIFORNIA



Dynamic Balancing Unit . . .

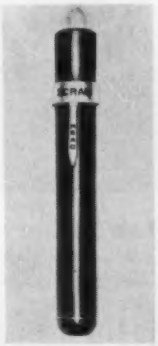
. . . for power plant machinery is reduced in size and weight through simplification of design. The Davey portable balancing equipment for in-place operation is completely self-contained and consists of a light beam vibrometer and stroboscope, used in combination. Calibration has minimum drift and the equipment employs no vacuum tubes.
Vibroscope Co, Glenford, N. Y.

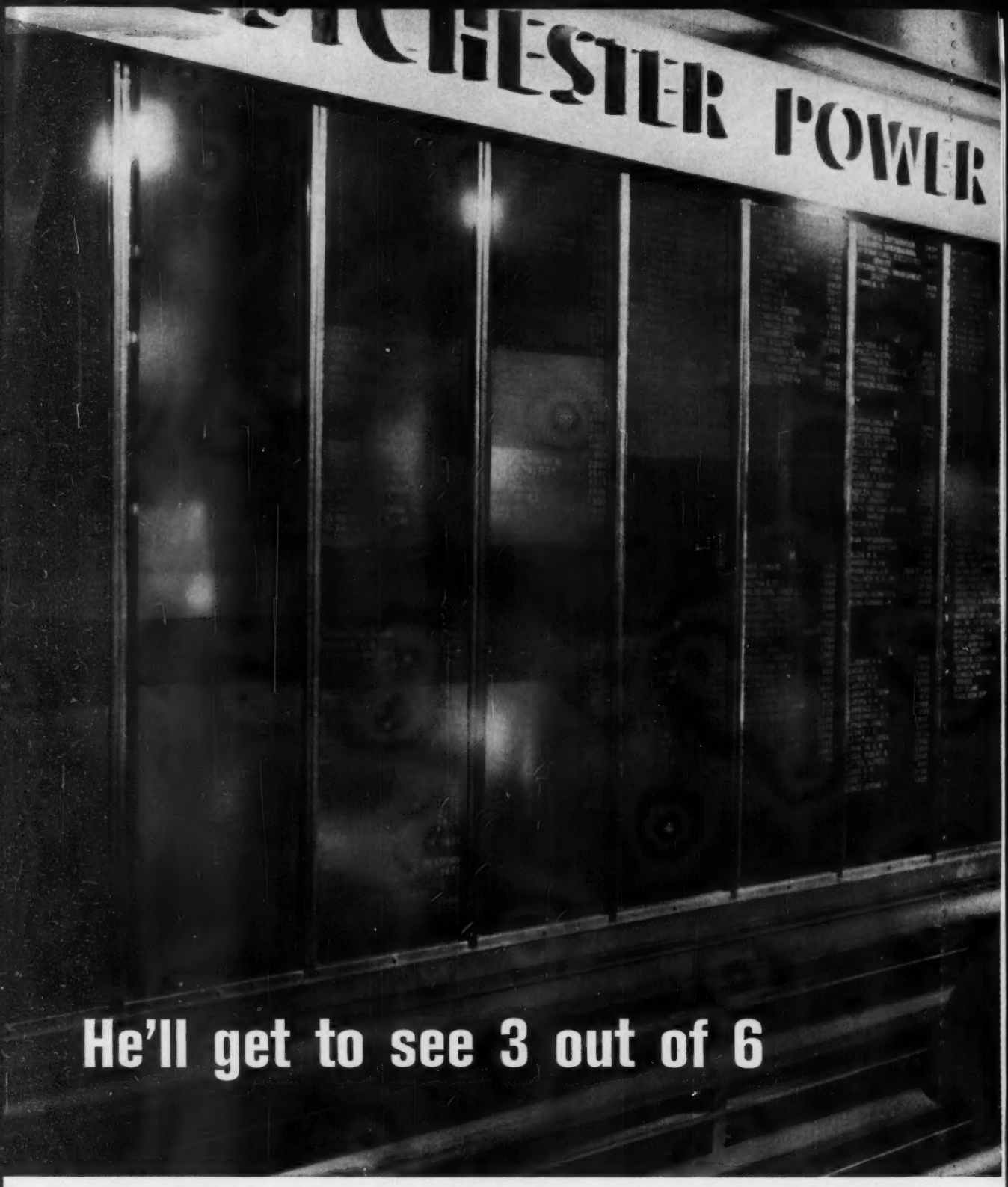
Aluminum Wedge Clamp

. . . for aluminum neutral messengers at service dead-ends, has aluminum-to-aluminum contact between conductor and clamp. This is said to eliminate bi-metallic galvanic corrosion and add substantially to the clamp's service life. Construction of the clamp is heavy-gage, high-strength aluminum alloy. Only four sizes of the clamp are needed to dead-end a range of cables from No. 6 solid through No. 4/0 ACSR.
Jasper Blackburn Corp, 1525 Woodson Rd, St. Louis 14, Mo.

Radiation Detector . . .

. . . supplements cart-mounted air monitors, and, in some cases, replaces them. The 3.5-oz pen-type dosimeter, Scram (self-contained radiation monitor), produces an audible chirping sound like that of a cricket through a miniature speaker. It can be carried in breast pockets by workers in radiation-hazard areas so that they do not have to take time to read a meter or check a counter.
Radiation Equipment & Accessories Corp, 665 Merrick Rd, Lynbrook, N. Y.





He'll get to see 3 out of 6

He'll see the chief electrical engineer, project engineer, and a design man. But three others are also important—two fast-raising assistants just breaking into buying, and the president, who is sitting in on more and more of the big buying decisions. He doesn't see salesmen. Of these six men who will make the final decision, then, your man has sold three. The big question: How to sell the other three when you can't even find them?

The answer: *Let them find you.*

For today's businesspaper reader, at all levels, looks for and depends on your messages to keep him informed on your company's thinking, your new equipment and installations, product improvements—on all the elements which form the underpinning of your market position. He needs this information, for it's part of his job. To sell him, integrate regular *sales communications in print* into your total sales program, market by market, product line by product line. Make your story interesting and factual—keep it customer-oriented.

*71,950, renewed ABC 12/31/60 **McGraw-Hill Laboratory of Advertising Performance Report 1052.8

number three of a series

Electric utility men, consulting engineers, contractors, and big industrial buyers of electrical equipment, for example, depend on Electrical World for business information. Turn-over of this audience is among the very lowest*, readership** and quality among the highest. Manufacturers' own studies show Electrical World to be the preferred business reading of the men who buy.

To make your salesmen *most* effective, back them with sales communication in print, in Electrical World!

a McGraw-Hill Businesspaper

Electrical World

the electrical industry's weekly magazine

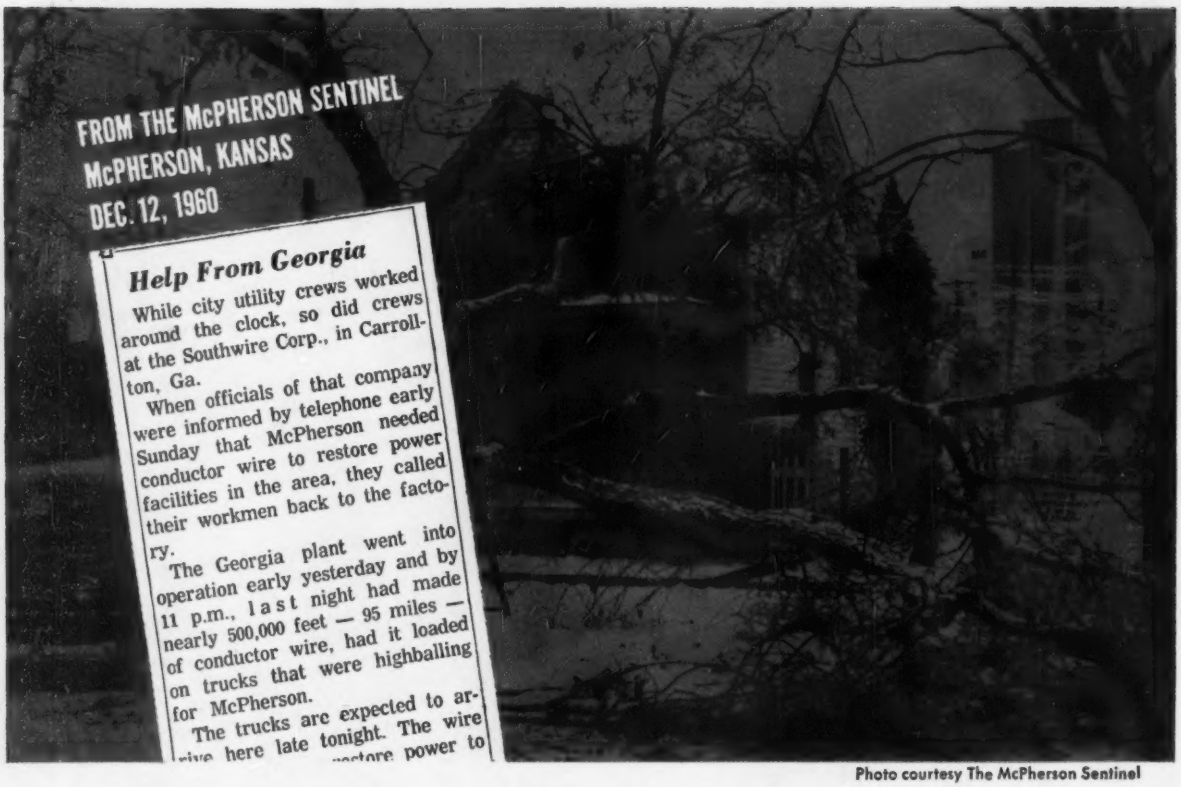

FROM THE McPHERSON SENTINEL
McPHERSON, KANSAS
DEC. 12, 1960
Help From Georgia
While city utility crews worked around the clock, so did crews at the Southwire Corp., in Carrollton, Ga.
When officials of that company were informed by telephone early Sunday that McPherson needed conductor wire to restore power facilities in the area, they called their workmen back to the factory.
The Georgia plant went into operation early yesterday and by 11 p.m., last night had made nearly 500,000 feet — 95 miles — of conductor wire, had it loaded on trucks that were highballing for McPherson.
The trucks are expected to arrive here late tonight. The wire

Photo courtesy The McPherson Sentinel

Some Wire Needs Can't Be Forecast, But Southwire Service Can!

Every man and every company has a different idea of the word "service."

With some, service means hours. With others it's a matter of days. Others, hamstrung by outmoded thinking and systems that are covered with cobwebs, think in terms of weeks.

At Southwire, service is paramount in every man's mind. We are proud of our reputation for quality, but we know that our business has been built on *service.*

Our concept of service is based on two facts: (1) Extremely flexible manufacturing schedules; (2) Rapid delivery by our own fleet of trucks.

We hope you will make us back up these claims. When you need wire in a hurry, call Southwire, and get acquainted with the fastest service in the industry. Remember: *Southwire means service!*

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable
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- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

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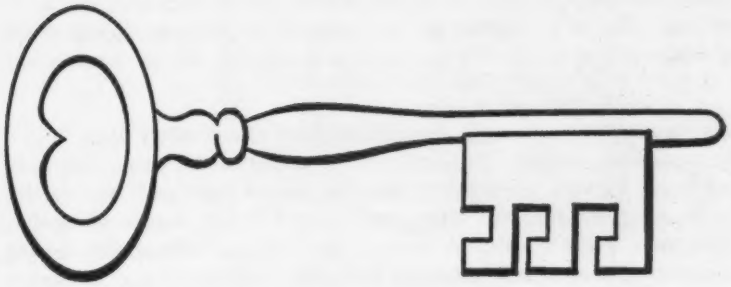
Electrical World

SEPTEMBER 4, 1961

Management Newsletter



What Does Turn-Key Mean? (Part 1)

> **turn-key job.** Any job or contract in which the contractor agrees to complete the work to a certain specified point, and to assume all risk.
>
> *Webster's New International Dictionary, Second Edition, Unabridged*

Last year, two almost unconnected events tossed electric utilities, their equipment suppliers, and their consultants, into a storm of controversy.

First, Oklahoma Gas & Electric Co awarded to General Electric Co a contract for a 237-Mw addition to Horseshoe Lake Station. Shortly thereafter, Texas Electric Service Co let one to Westinghouse Electric Corp for a 350-Mw unit at existing Handley Station.

These awards had two common features which triggered the controversy. They placed in the hands of an electrical equipment manufacturer the undivided responsibility for plant engineering, procurement, construction, cost, and performance, and the contracts were for a guaranteed lump sum. They were "manufacturers' fixed-price turn-key" contracts.

To many observers, the lesson was clear: the manufacturers were moving into the domestic steam plant engineering and construction business, and life might never be the same for buyer, seller, or the man in the middle. A clean break with tradition had been made with these two cases, a tradition founded upon the practice of

US utilities retaining for themselves the final responsibility—and the risk—for cost and performance of their steam plants.

The industry then anticipated further manufacturers' fixed-price turn-keys for steam plants, but they have not yet come. One, especially, had been expected—a major project by Florida Power & Light Co.

When this project didn't go the turn-key route, controversy surrounding the concept ebbed, and many now proclaim the whole thing to have been a flash-in-the-pan, something to be conveniently forgotten. But is the subject dead? What did it mean while it lasted? Has the industry as a whole gained anything from this experience?

A careful inspection of the facts of course reveals that the OG&E case is a prototype, though full-size, of a thermal cycle not yet completely proven for utility acceptance. In this respect, the placing of "all risk" on the manufacturer, including that for conceptual design, smacks closely of other prototype turn-keys, chiefly in the nuclear field. And in the Tesco case, the utility more than participated in the conceptual design settled on—*before* the single-responsibility, all-risk contract was drawn.

Moreover, both contracts were set in the framework of an extremely weak, highly competitive equipment market. This undoubtedly added to the controversy and possibly influenced the very low contract price for Tesco's Handley Station (under $80/kw on manufacturer's turbine rating, and under $70/kw on turbine capability). Whether there is any connection between the now gradually firming market and dwindling turn-key interest is something else again. Add to this another factor: the Justice Department's concern with certain legal aspects of package bidding.

The subject of turn-key is thus a complex one, and to place it in some sort of perspective, *Electrical World* editors have had hundreds of conversations with persons in all segments of the industry.

Judging from these conversations, it was found that the word "turn-key" means all things to all people. But there is one central theme—"undivided responsibility with acceptance of all risk." This theme could be applied to a complete steam plant—or to any other project—or to any part of a project agreed upon contractually. It might or might not include conceptual design; it might or might not include a lump sum price (fixed price). It definitely would not preclude the prime contractor from sub-contracting any or all of the activities under the main agreement, as is being done for certain portions of the OG&E and Tesco contracts. Nor would it prevent the owner from retaining his own engineering consultant to perform inspection and insure compliance as Tesco is doing with Handley Station.

When considering utility steam plant turn-keys alone, there are even more variations possible. In the extreme, the utility's original specifications could merely outline the basic requirements of size and on-line date, as well as give boundary conditions such as system load pattern to be met over the plant life, fuel availability and cost, site conditions, etc. Here the turn-key bidders would do conceptual designs, each preparing a priced proposal—probably in some descriptive detail—of the plant each believes would best meet the specified need. And the bidders would also guarantee plant performance (probably with a penalty clause in the contract).

At the other extreme, the utility would specify a complete conceptual design, including thermal cycle, proposed layout, acceptable equipment makes, and so on, and the bidders would simply quote a price for the turn-key job.

With either extreme, it is likely from a practical viewpoint that discussions during the negotiations would permit utility and bidders to interject various engineering, quality, and cost factors, and accordingly modify specifications and/or proposals—and price. These discussions and negotiations are not new in the utility field for they take place often before conventional contracts between utilities and engineering contract are drawn up.

What's different with turn-key is that once the negotiated contract is signed, the utility deals with only one contractor (whether it be a manufacturer or an engineering firm), and this contractor *has assumed all risk from that point on.*

For apparatus manufacturers, this arrangement could open a potentially highly significant door. It could permit them to enter strongly into—perhaps control—the conceptual plant engineering for a conventional domestic steam station. It should be noted that in the Tesco case, they did indeed get into this area much more than usual, but here the influence of the owner was so dominant that this case cannot be considered typical of true full-scope turn-key.

For consultants, it could have a similar effect. Some major consultants have been trying to sell the idea of full-scope turn-key, including conceptual plant engineering, in the domestic power plant field. But they've been unsuccessful, though they've long had such arrangement in other industries. Perhaps, now, the ice has been broken for them as well.

The OG&E and Tesco contracts of last year marked the reappearance of turn-keys in the US electric utility field. Back in the early days of utilities, manufacturers provided plant engineering as a service which went along with the sale of equipment, besides arranging for purchase of apparatus that they did not manufacture themselves. This, in fact, was turn-key. In addition, the US turbine manufacturers are still doing turn-keys on much of their export business.

But domestic utility turn-keys disappeared as utilities grew and banded together. The resulting holding companies quickly developed engineering service organizations that took over plant engineering and apparatus procurement from the manufacturers. When the holding companies disbanded, many of the service organizations survived as independent engineering firms with the utilities as their initial clients. These consultants often provided many services for their clients, but the important one was steam plant engineering. Their degree of participation in these steam plant projects ranged widely, from pure engineering to the taking of the prime construction contract. Generally, though, the "all-risk" turn-key feature was avoided.

At the same time, the utilities grew in size, and some of them disassociated themselves from the consultants, preferring to take the full engineering services function on their own shoulders.

During all of these developments, cost was seldom the major factor in power plant construction; the important thing was quality. But along came the type of engineer-constructor who offered to sell a power plant on some form of guaranteed price basis. He wanted the chance to give a good price for a plant whose conceptual design was set by the utility and where major apparatus was procured by the owner. However, he did want to do the detailed engineering and to include procurement of other apparatus and materials in the contract.

This shook the close relationship long established between the engineering consultants and their clients because it promised cost savings for the buyers. Many of them felt they should investigate the offers and even ask their consultants to meet the offers, or explain why they were against them. Gradually, the emphasis on price in utility plant procurement has increased, until now much work is done with bid or negotiated price often guaranteed in some form, a real part of the contract.

But utility management wouldn't have been receptive to a greater emphasis on plant cost if there hadn't been a growing cost-consciousness on their part. Why this exists is another matter, but it does exist and the reappearance of manufacturers' fixed-price turn-keys is more than coincidental with its promise of reducing capital charges.

In many ways, some of the large, integrated manufacturers feel they have been

drifting away from the basic problems of their customers, especially in the field of systems design. As a result, some management factions in these companies believe the turn-key job provides the ideal vehicle for achieving a dual objective. First, turn-key would permit the most concentrated attack on costs possible because, they say, the manufacturer has the best control over the largest part of them. Second, it would allow him to examine his customer's systems design problems from a fresh point of view and give him a major say on how the latest equipment technology could play a part.

When last year's chaotic equipment market conditions coincided with two utility managements who were receptive to—in fact, were actively pursuing—these arguments, the two turn-key cases blossomed forth.

In the OG&E case, the manufacturer, GE, had been trying for some time (but unsuccessfully) to convince some gas-burning utility to build a full-scale prototype plant which would incorporate a gas-turbine/steam-turbine combined cycle. Finally, to sell this prototype, GE proposed a protective contract at a fixed price and in which it assumed all the risk and guaranteed thermal performance. OG&E accepted it.

The Tesco case was completely different. One branch in the evolution of steam plant design was that of manufacturers of certain major plant apparatus supplying more and more auxiliary equipment as a coordinated package with the major item. For example, the steam generator manufacturer gradually began to take full responsibility for coordinated design of a "package" (including boiler fans, air preheater, burners, etc) and for supplying all such equipment along with the steam generator. This really began the so-called "island" concept.

J. B. Thomas, Tesco president, was in the van of utility engineers pushing for the turbine manufacturers to supply an equally coordinated package of apparatus built around the turbine-generator. Some call this the "turbine island." Pushing this idea strongly, Thomas felt that last year the time was ripe to extend the fully coordinated design to an entire steam plant, and the major integrated manufacturers —with various degrees of enthusiasm—vied with each other to see what manufacturer-coordinated design could do. Westinghouse won the contract.

Without question, a good many of Thomas' own ideas were put into this plant, some of them quite unorthodox. And there is controversy as to whether the same pricing could not have been accomplished with a more conventional design under the existing equipment market. But none will deny the stimulation that has been thrown into plant layout engineering by Thomas' efforts.

Also, the Tesco negotiations revealed what may be a most difficult problem in manufacturers' turn-key bidding. Suppliers sub-bidding to the major apparatus manufacturers submitting prime bids were often asked by each to draw up separate proposals in considerable detail.

The cost of these extra designs, taking into account that only one of them was ultimately accepted, was deemed by many to be exorbitant. As one pointed out acidly, someone would have to pay for the unused designs in the long run, with the cost eventually tagged on to the successful bids, if this type of bidding became prevalent.

Possibly as a defense against this argument, Thomas has suggested that the Tesco-Handley design be accepted as an industry standard and thus spread the cost of the preliminary designs. But the question is yet unanswered as to whether this proposal is even feasible.

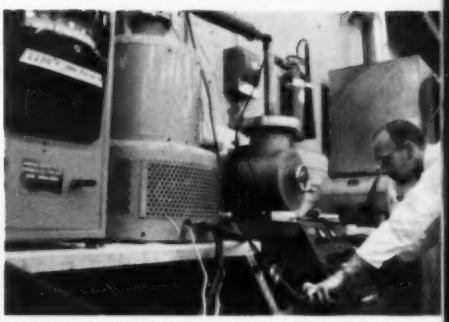
Despite misgivings such as these there are those who believe turn-key contracts have great possibilities over the long haul. And there are others who disagree.

Management Newsletter will explore these conflicting views next week.

Why Westinghouse is one of world's leading suppliers of nuclear fuel elements and complete cores

Quality Control. High sensitivity, immersion ultrasonic inspection of tubular and plate fuel elements detects flaws and simultaneously provides written records. Other special quality control equipment includes x-ray, chemical, and metallographic laboratories, eddy current and leak testers, and panoramic cameras for filming internal surfaces.

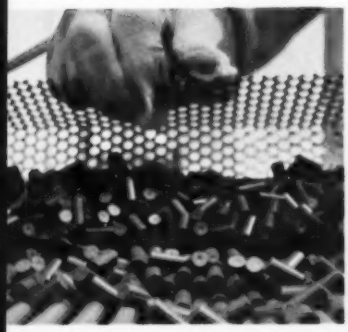
Rods and Assemblies. This technician is welding a stainless steel fuel rod. Westinghouse successfully fabricates aluminum, zircaloy and stainless steel rods and assemblies. Rods can be up to 1" in diameter and up to 130" long. Assemblies can be up to several thousand pounds.



Fuel Development Laboratory. Each job is completely pre-engineered in a commercial fuel development laboratory. This engineer is sintering cermets in an experimental furnace with instrumented vacuum unit. Laboratory has equipment for development work on all types of potential fuel materials and processes.

Modern Equipment. Facilities include pre-sintering and sintering furnaces (shown above), special vacuum welding boxes, vacuum annealing and vacuum induction melting furnaces, autoclaves for corrosion testing, rolling mills for hot and cold rolling, brazing equipment, brake presses for tube forming and plate bending. Other special production equipment includes a 48' high core assembly room with complete optical alignment and gaging equipment.

Atomic Fuel Department. Westinghouse provides industry with a completely equipped, integrated fuel fabrication facility, located at Cheswick, Pa. Products include pellets in any enrichment, pellet loaded and plate-type fuel elements, core components and completely assembled nuclear cores.

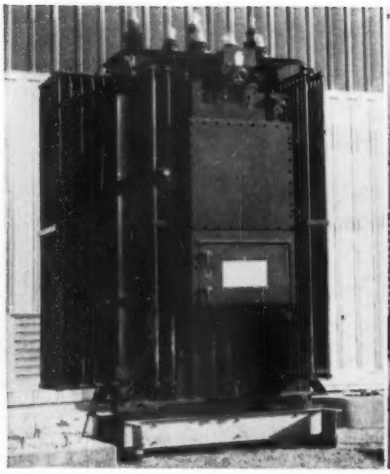


High Quality Pellets. Westinghouse can produce solid, hollow or spherical pellets, in sizes from .100" to approximately 1". A.F.D. has three compartmented pellet lines capable of simultaneously producing UO_2 pellets of three different enrichments.

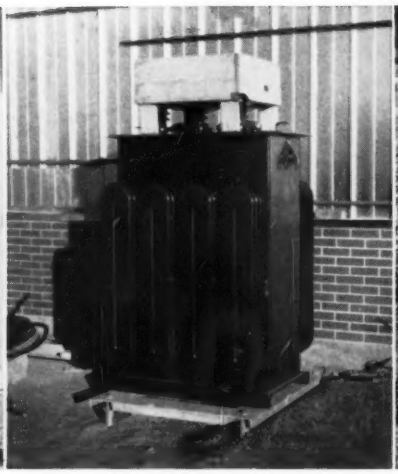
Electron Beam Welder. This 48" diameter, 28' long vacuum chamber encloses a 2 kw, 150 kv electron beam welding head. Unit is capable of welding pieces up to 24" in diameter, 10' long, at speeds up to 100" per minute. Equipment is used for welding aluminum fuel elements and permits closely controlled welds in refractory metals.

JI-59504

Westinghouse



This 15 ton 2500 kva power transformer is mounted on a base supported by eight 15" diameter Chance foundation anchors, instead of the heavy reinforced concrete bases normally constructed for such installations.



A 300 kva unit substation transformer mounted on four 10" diameter anchors. Units like this can be installed in less than a day, since the foundation can be completed in approximately one hour.

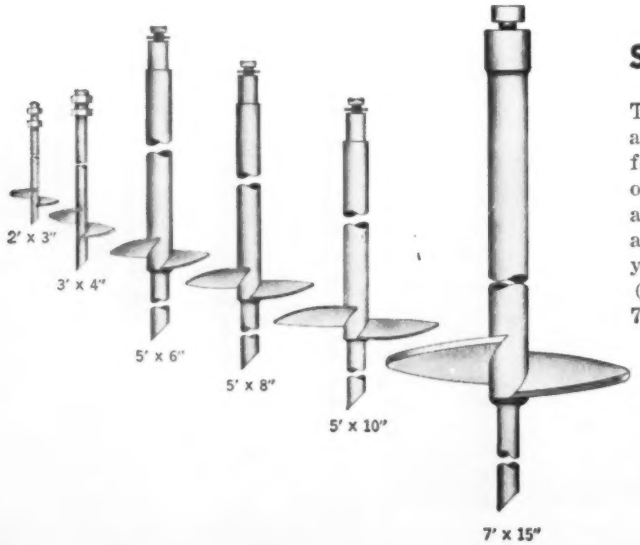
A 25 kva "pad-mounted" distribution transformer mounted with four 6" foundation anchors. Surface moisture is no deterrent. Final back-filling will bring the finished grade up to the transformer support frame level.

MOUNT TRANSFORMERS with CHANCE Foundation Anchors

- No Concrete Pads to Pour
- No Delays for Grading
- No Need for Building Permits

Now, you can cut installation time and costs for all types of surface mounted transformers — from small "pad-mounted" distribution units to fairly large power transformers. Chance Foundation Anchors support transformers securely—eliminate the need for special excavations, rock foundations, pouring concrete or handling pre-formed pads. The anchor "foundation" is impervious to freezing, thawing, or moisture penetration because the anchors screw down below the frost level.

These anchors can be quickly installed. Four six inch anchors and the support frame for a typical "pad-mounted" transformer can normally be hand-installed by two men within one hour. Fifteen inch diameter anchors for large transformers are speedily installed with standard power digging units. Write for detailed information on how Chance Anchors can help you save transformer installation time and costs.



SIX SIZES NOW AVAILABLE

The acceptance of the six inch foundation anchor for "pad-mounted" distribution transformer installations has led to the development of a range of sizes that suggest a variety of applications — as foundations for tool sheds, air conditioners, shelter houses—whatever your ingenuity can suggest. The size range (from 3" diameter X 2' rod to 15" diameter X 7' rod) is show at left.

A. B. CHANCE CO.
CENTRALIA, MISSOURI
A. B. Chance Co. of Canada, Ltd., Toronto

CA61-26

Broad Program Helps Sell Electric Heating

All-electric home gain spurred by new total-electric rate, expanded sales force, heightened dealer interest

JAMES M. FOREMAN, JR, Supervisor, Residential Promotion Division, and **DAVID REA,** Supervisor, Promotional Advertising, Duke Power Co, Charlotte, N.C.

Duke Power Company's promotion of electric house heating in 1959-60 has proved highly successful. The company served about 500 electric heating customers when it decided to vigorously promote this load to increase revenue, improve annual load factor, offset the effects of gas competition and create preference for total-electric living.

First step in the promotion was adoption of an all-electric rate with a low step of 1.5 cents compared to 2 cents for the low step on the regular rate. The new rate became effective Oct. 1, 1958.

At the end of 1958 the company had only 632 residential electric heating customers of which 267 were electric comfort heating (resistance heating) and 365 were heat pump installations. In 1959, 1,073 customers installed electric heating. In 1960, 2,301 total-electric homes were added to Duke Power's lines, making a grand total of 4,006. Of these 2,885 were comfort heating installations and 1,121 were heat pumps.

How was this rather sudden increase in electric heating customers brought about? The new rate played a key part and was perhaps the first essential to success. However, there were several other necessary features:

1. A sharp increase in trained sales personnel.

2. Development of active and qualified dealers in the electric heating field.

3. A stepped-up program of promotion of electric heating.

4. A new wiring plan which reduced the installed cost differential between electric and gas heating systems.

5. Employee education.

Soon after the new total-electric rate went into effect, Duke Power established a school covering all aspects of electric comfort heating and heat pumps plus sales techniques to be used. The ten residential representatives who had spent full time promoting heat pumps, plus 34 other employees, were trained in comfort heating.

The 8-hr-a-day, 30-day school was taught mainly by Duke Power employees. Manufacturers' representatives also lectured and discussed their equipment.

Fourteen graduates of the school were promoted to residential representatives. This boosted the electric heating sales force early in 1959 from ten to 24 men.

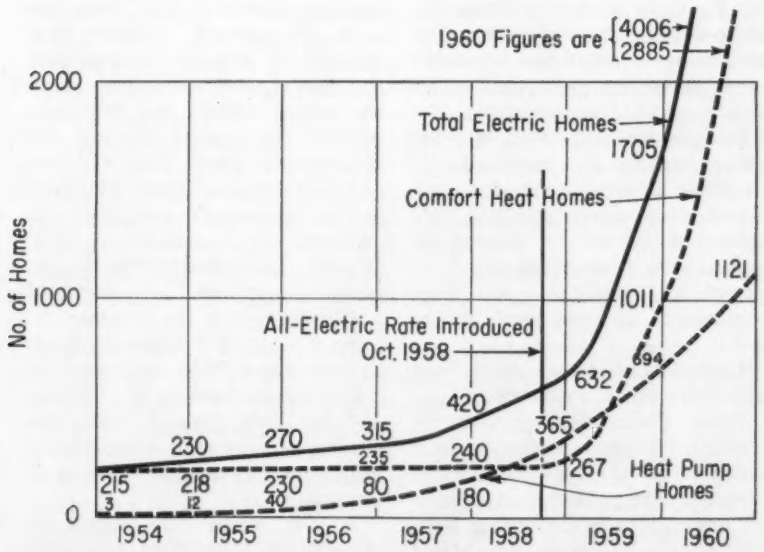
As the promotion of comfort heating shifted into high gear the work load of residential representatives grew rapidly. A second school was conducted in 1959 for 27 men. Of this group 12 became residential representatives, bringing this field force to 33 late in January 1960.

During 1960 all residential representatives attended three special meetings with manufacturer representatives. These meetings dealt with: 1. Evaluation of results; 2. resolution of heating equipment service and application problems; and 3. New products, their market potential and sales strategy.

Home service representatives were also given specialized training that would help them in making home calls and group presentations and in developing electric heating prospects for residential representatives. The 23 home service advisors spent two days learning key aspects of electric heating. In addition they were given refresher training during 1960.

One of the first jobs undertaken by residential representatives after they had completed the first 30-day training course on electric heating was to help establish electric comfort heating dealerships. At that time only a few dealers were capable of installing equipment.

One objective of early advertising on comfort heating was the stimulation of prospective dealers. These ads plus the enthusiasm of residential representatives and promotion plans caused many contractors



SALES of 4,006 electrically heated homes by the end of 1960, compared to 632 in 1958, were recorded in Duke Power's all-inclusive heating promotion

to take on lines of electric comfort heating equipment. At the end of 1959, 142 dealers were busy promoting and installing equipment.

As the number of active and prospective dealers increased during the summer and fall of 1959, 20 dealer schools were scheduled in 19 cities. Students were given a comprehensive course in all aspects of electric comfort heating during five 2-hr evening sessions for each school. About 700 men from warm air and electrical contracting firms enrolled in the schools and 604 attended all sessions, completed all work and were graduated.

In 1960 an advanced course in electric comfort heating was offered to all active warm-air dealers and electrical contractors who had completed the 10-hr of basic training given in 1959. Over 160 men completed the "workshop-type" school comprising four evening sessions. They studied application and installation techniques and special emphasis was placed on estimating operating costs.

Duke Power is also assisting and cooperating with dealers in many other ways. Residential representatives develop prospects and dealers close sales.

Dealer Literature Developed

Duke also developed several pieces of literature to aid dealers. These included: 1. A manual of electric comfort heating; 2. A four-page plastic-covered folder which simplifies the calculations of heat loss in terms of watts loss; 3. A form for listing heat loss and operating cost data which assures completeness of calculations; 4. A four-page promotion pamphlet, which is used as a direct mail piece, gives prospects a sales story on electric comfort heating; and 5. Data sheets which include operating costs of actual homes to assure customers that costs are competitive.

Duke Power also inspects homes during construction. If insulation is not installed properly, the residential representative arranges a correction to prevent complaints to dealers and assure customer satisfaction.

First ads on electric comfort heating were published in April 1959, chiefly to help stimulate the interest of dealers and builders but also to start educating customers. Then comfort heating ads were discontinued until September, 1959 when enough dealers were operating to handle the anticipated sales. Meanwhile, heat pump ads were continued, and heat pumps and comfort heating were both advertised as part of the features in the Gold Medallion Home.

Most of these ads were general in nature, but about 250 promoted specific Gold Medallion open houses which had electric heating installed in them during 1959 and 1960.

These special ads in newspapers and on radio and TV were part of a program of helping builders advertise Gold Medallion homes that were open for inspection. At these openings residential representatives discussed the merits of electric heating with visitors who averaged about 700 per open house.

While all ads appeared to be effective, one in 1959 produced outstanding results. This was a testimonial and stressed the saving from the new electric comfort heating rate. Calls literally swamped the telephone exchange for a full day in the office that serves the owner of the particular home.

Duke Power also "pulled all stops" for newspaper advertising of such special events as Parades of Homes.

Half of the company's advertising in 1960 involved electric heating. About 40% of the total expenditures was for electric comfort heating or heat pump ads, and 10% was for Gold Medallion Home ads which stressed electric heating. The advertising in 1960 was scheduled as a continuing promotion rather than in short-term campaigns.

Profiting from experience with the one ad in 1959 that produced outstanding results, testimonial ads were used in newspapers and over radio and TV stations serving the general area from which the testimonial was obtained. Ads were prepared on 33 testimonials during 1960.

Dealers were encouraged to tie in with Duke Power's advertising.

News stories dealing with the growth of electric heating and on Duke Power's Housepower Panel Program were published in most of the newspapers in the service area. Special articles dealt with Gold Medallion Home open houses. At least 175 talks were made on electric heating by sales representatives.

One promotional stunt that received wide publicity was the helicopter delivery of a Gold Medallion electrically heated dog house to a Gold Medallion home where there was a Boxer puppy named "Gold Medallion." Four TV stations in three cities carried a one-minute filmed news item on the event, two daily newspapers gave it coverage and about 500 customers witnessed it.

Steps were also taken to educate employees on electric heating. More formal presentations were made during three Employee Communications Programs. The first in November, 1958 explained the new all-electric rate, the new policies and the facts on electric heating.

A year later, the second program, in effect, asked employees to use and promote electricity for all purposes and showed them how they would benefit. This program stressed electric heating.

With the introduction of the Housepower Panel Plan, another Employee Communications Program was presented to spell out the details and again solicit the cooperation of all employees concerning electric heating. To prove customer satisfaction and operating cost aspects, 17 testimonials were used from employees in all departments across the system.

Less Formal Means Also Used

Less formal means of presenting the electric heating story were also used. "Tail-board" sessions were initiated by many local managers. Residential representatives made the rounds asking for prospects. Articles on electric heating, the Housepower Panel Plan and employee testimonials were published in the company's magazine. In addition, a newsletter, called SPARK, published primarily for promotion personnel, was circulated widely throughout the company.

As a result of this education and encouragement, 124 employees installed electric heating in 1959 and 117 in 1960. This increased the number of employees using electric heating to 268, or almost 5% of all employees.

A new wiring plan, called the Housepower Panel Plan, was introduced in May 1960. Under this

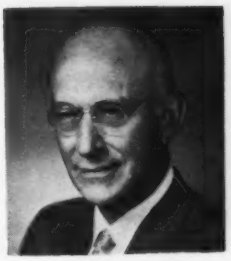
(*Continued on page 75*)

Richards Chosen Kansas G&E Vice President

Neill Richards has been elected a vice president of Kansas Gas & Electric Co. He has been secretary-treasurer and a director since 1944.

Richards began his utility career in 1919 with Interstate Power Co and was later its treasurer. He has also served as assistant treasurer of Utilities Power & Light Corp.

During World War II he left the utility field briefly to become an administrator and business consultant in the office of the Alien Property Custodian.



RICHARDS

PERSONAL BRIEFS

In South Carolina, **Clyde F. Boland** has assumed the chairmanship of the Public Service Commission. **Winchester C. Smith** was appointed vice chairman.

Niagara Mohawk Power Corp has made **Osborne B. Nye** manager of the new systems sales staff.

C. F. Moulton, general manager of Omaha Public Power District, has been appointed chairman of the newly formed Nebraska Public Power Committee.

At Shawinigan Water & Power Co, **H. M. Burgess** has become administrative assistant in the Montreal office. **W. C. Watt** was named assistant superintendent - generating division, and **W. D. MacAulay,** assistant superintendent - substation and transmission division.

Walter O. Woodward has been promoted from assistant personnel director to superintendent of Pacific Power & Light Co's Wyoming division, with headquarters in Casper.

Leonard W. Atchison, formerly General Electric Co manager of engineering for room air conditioners, has been appointed engineering consultant in the air conditioning department. **William G. Spiegelhalter** succeeded Atchison as engineering manager.

Dr Robert L. Loftness has been named eastern representative for Atomics International, succeeding **Robert H. Sehnert** who was assigned to advanced planning at the company's Canoga Park, Calif., headquarters. Eastern office of the North American Aviation, Inc, division is in Washington, D. C.

Harry L. Niederauer has become manager of marketing services for Westinghouse Electric Corp's lamp division.

G. R. Mays is the new manager of Bailey Meter Co's north central region, encompassing Chicago, Cincinnati, Cleveland, Detroit, Milwaukee, and St. Paul.

Allis-Chalmers Manufacturing Co has appointed four assistant engineers to its nuclear power department. Three were assigned to the Greendale, Wis., facilities: **Ralph H. Klumb, Aaron A. McIlheran,** and **Chan H. Yeh.** Named to the Washington, D. C., operation was **Branch D. Elam Jr.** Meanwhile, A-C named **Daniel F. McNulty** as an application engineer in the control department and **Eugene M. Underwood** as an assistant engineer in power systems engineering, both in the industries group.

Minneapolis - Honeywell Regulator Co has promoted **Dr John N. Dempsey** to associate director of research for its research center, and **Dr Carl Nomura** to technical director of the company's semiconductor division.

OBITUARIES . . . Harry G. Pruett, 72, director of safety, Electric Power Board of Chattanooga, from 1939 through 1956 . . . **Leslie White Morris,** 75, first chairman of the Frankfort (Ky.) Electric and Water Plant Board.

I-T-E Transformer-Rectifier Division Manager Named

William G. Long has been named manager of I-T-E Circuit Breaker Co's transformer and rectifier division. He is responsible for the over-all operation of the division, located in Philadelphia, which produces semiconductor rectifiers and power transformers, as well as packaged unit substations. Long succeeded Otto Jensen who recently joined the corporate engineering staff.

LONG

Walker Chosen Director

Donald S. Walker, president of Caribbean Equipment Co, has been named a director of Hamilton-Thomas Corp, a subsidiary. He also will serve as a director of two Hamilton-Thomas subsidiaries, Griscom-Russell Co and C. H. Wheeler Manufacturing Co.

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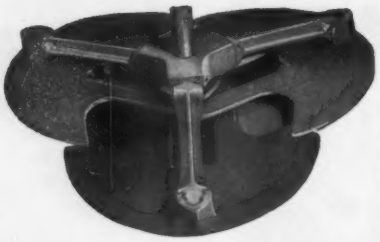
QUICKLY Installed
TOUGH For long life



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MANUFACTURERS BRIEFS

• **Baldwin-Lima-Hamilton Corp** and **Industrial Process Engineers,** Newark, N. J., have formed a jointly owned company, Transitel International Corp, to develop telemetering equipment and systems for industry. Transitel's initial effort will be to develop devices for such uses as automatic reading of electric meters and other operations in which data must be transmitted rapidly. President of the new firm is Christopher T. Kastner, former manager of manufacturing for the power transformer department of General Electric Co.

• **Bechtel Corp** has established an operations center for Australia and New Zealand in Melbourne, Australia. Engineering, procurement and contruction services will be provided through the new office headquarters, under the name of Bechtel Pacific Corp, Ltd, for Bechtel projects in the two countries.

• **Midwest Piping,** a division of Crane Co, has received a $5-million contract from Pacific Gas & Electric Co to fabricate and erect all piping for new units at its Morro Bay, Calif., power plant. It covers the fabrication and erection of all piping and the furnishing of all valves and hangers for two new turbines (total output of 660 Mw and for two boilers (capacity in excess of 4,000,000 lb per hr). The piping will operate at 2,400 psig, 1,050F.

• **General Electric Co** has received its largest order for station-type switchgear since World War II from Consolidated Edison Co of New York, Inc. The 27-kv distribution system which GE will manufacture will include: 12 bus and transformer breaker cubicles with 3,000-amp Type ARH air-blast circuit breakers, associated disconnecting switches and bus; 24 feeder cubicles with 1,200-amp Type ARH air-blast circuit breakers, disconnecting switches and bus; and a light-and-power breaker cubicle for station service. Four 132/28-kv power transformers will feed four bus sections which will be enclosed in indoor cubicles rated 34.5 kv. Shipment will be completed by November, 1962.

• **Sprague Electric Co** will open a branch manufacturing plant in Hillsville, Va., this month. This will bring to 21 the total of Sprague branch and subsidiary operations in the US and overseas. The company makes electrical and electronic components and semiconductors.

• **Graybar Electric Co** will break ground shortly on a recently acquired Philadelphia 150,000-sq-ft site, where it will erect a modern, air-conditioned building to house district offices.

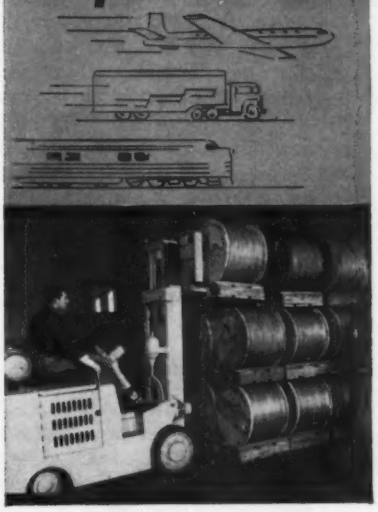
• **Square D Co** has completed a 10,000-sq-ft addition to its Atlanta, Ga., warehouse facilities, the third expansion project finished by the company so far this year. The other projects were a new plant in Asheville, N. C., and a 16,800-sq-ft warehouse in St. Louis. Square D recently announced plans to make an 80,000-sq-ft addition to its Lexington, Ky., plant.

• **Babcock & Wilcox Co** has been selected to manufacture and erect two radiant-type boilers for Pacific Gas & Electric Co's Morro Bay Station in Calif. Units will power two 325-Mw turbine-generators, increasing plants total capacity to 990 Mw. Each boiler will develop 2,160,000 lb of steam per hr at 2,725 psi and 1,050F, with reheat to 1,003F. Project is part of PG& E's $71-million expansion program.

• **Crane Co** has purchased "substantially all" the assets of Deming Co, Salem, Ohio—a manufacturer of pumps for over 100 years. Demings' sales of pumps and water systems have averaged more than $10 million for the last few years. It is estimated that the transaction will involve more than $5 million. The move marks another step in the company's expansion program in the field of flow control.

• **Fluor Corp, Ltd,** has announced name and location changes for its New York engineering subsidiary, Singmaster & Breyer, Inc. The new name is Fluor-Singmaster & Breyer, Inc, and it leased 35,000 sq ft at 100 Park Ave to accommodate its 300 employees.

Prompt Emergency Shipments



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Phone the distributor of *Crapo* Galvanized Steel Strand near you the next time you need strand.

INDIANA
Steel & Wire Co., Inc.
Muncie, Indiana

Selling

(*Continued from page* 72)

plan a homeowner, builder or other individuals who qualified, received a complete Housepower entrance consisting of the riser and a panel with circuit breakers. The plan is available to those who qualify for Duke Power's total-electric rate. They receive either a 150-amp or 200-amp panel with up to six 240-volt circuit breakers. Duke Power also paid a flat amount to have a riser installed, $65 for a 150-amp riser and $80 for a 200-amp riser. The company owns, capitalizes and maintains this equipment.

In addition to the Housepower Panel Plan, Duke Power gave builders a promotional allowance to stimulate the construction of Gold Medallion Homes. For the first 10 Gold Medallion Homes constructed by a builder during the calendar year the company paid $75 each if equipped with electric comfort heating and $100 each if equipped with a heat pump. These amounts were increased by $25 each for all Gold Medallion Homes over 10.

Sales aids were also made available to builders. For Gold Medallion open houses residential representatives and home service advisors were available to promote the electrical features.

Other sales aids included:

1. Outdoor floodlighting fixtures and cable.

2. Several booklets on Gold Medallion homes, electric heating and lighting.

3. A customized insert for the Gold Medallion Home booklet.

4. Gold Medallion floor runners.

Results of the home heating program speak for themselves. In the two-year period, 3,374 electrically heated homes were added, providing a revenue of about $1.1 million annually, compared with only $160,000 if they were gas-electric.

In 1960 the total-electric homes added helped to increase the use of residential electric service by 340 kwhr per customer to 5,381, an increase of 6.75%. About 10% of the homes built were electrically heated. The proportion exceeds 40% in several areas where natural gas is not competing vigorously.

Of the 3,374 total electric homes added in 1959 and 1960, 854 were Gold Medallion Homes.

Installation Economy with Time-Saving
"SIZE-MARKED"
MINERALLAC®
"Minny-Twist" TRADEMARK
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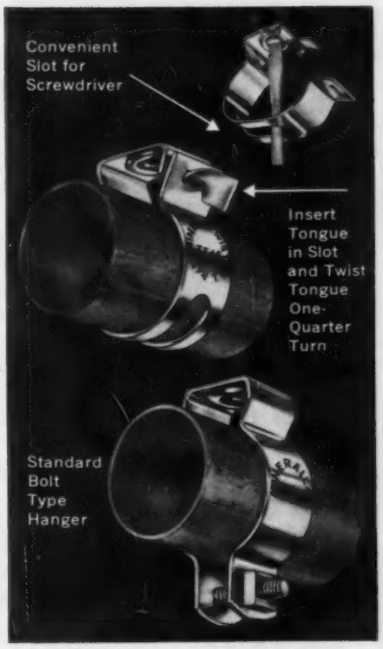

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Power Sources Called Main Co-op Problem

Panels explore problems of rural electric, other cooperatives at American Institute of Cooperation annual meeting

Rural electric cooperatives cannot stay in business unless they find sources of power for re-sale . . . National support for the cooperative movement must be built at home . . . Federal laboratory is needed for research into farm electrification. These comments summarize a panel discussion on rural electrification held during the 33rd annual meeting of the American Institute of Cooperation, Aug. 20-23, in Minneapolis.

"To obtain, achieve or find sources of power to sell is a monumental problem, probably the most important in the co-op movement," said Richard D. Wood, Rural Electrification Administration. In five to seven years rural systems must double the amount of power now available; in some areas, there is even less time.

Shun Dual-Rate Clauses

He pointed out that about 80% of the power sold by rural co-ops is bought at wholesale, of which half is purchased from investor-owned systems. The 40% of co-op power delivered from other sources is purchased under "reasonable, long-term contracts, although in some cases at a cost higher than we would like to pay," Wood said. And "30% of commercial power" from investor-owned systems is purchased under restrictive contracts, with the "dual-rate clause" an example of such restrictions, according to Wood.

However, the present REA administration to date has not approved any contract which includes a dual-rate clause. "We have been successful in recent months" in getting three utilities in Mississippi, Ohio and Texas to strike the dual-rate clause from their contracts. Regarding the Texas utility, Wood said a special incentive was a "small G&T loan" approved by REA, alluding to the $14,683,000 loan for South Texas Electric Co-op (EW, May 29, p 20).

In answer to questions, Wood remarked that the 19 utilities offering dual-rate clauses are located generally in a belt running south from Minnesota through the Midwest, then veering toward the southeast. REA is looking into whether the uniformity of these dual-rate clauses represents collusive action and thus violates the antitrust laws.

One effect of the dual-rate clause will be to deny the use of Rural Areas Development (RAD) funds from REA to areas in which these clauses are operative, Wood added. Further questioning brought out that applications to REA for G&T loans are greatly in excess of funds "perceived to be available in the near future" for such loans. In response to questions from Clyde Ellis, NRECA general manager, Wood said, "It is a fact that we will run out of money" for G&T loans, not just a probability.

Freeman Keynotes

Keynote speaker for AIC's meeting was Orville L. Freeman, Secretary of Agriculture, who urged all types of cooperatives to band together to strengthen the bargaining power of farms. He suggested that cooperatives "consider further expansion into the processing of agricultural commodities as one way of bringing to the farmer a fair share of the consumer's dollar."

This need for cooperation was continued by Richard M. Hausler, director of REA's RAD program (EW, Aug. 7, p 24). Hausler told the meeting that "we shall rely heavily upon AIC and other cooperative organizations to provide us with the information and education which we need."

Under the RAD program, Hausler said that electrical machinery for commercial, industrial and agricultural enterprises may be eligible for financing under REA's Section 5 Loan Program. Loans may be made for up to ten years or for longer periods for up to two-thirds the life of the machinery. As a member of the rural electrification panel, Hausler added there is no dollar maximum for these machinery loans, but REA will look at the security and conditions of the loan. And prospective enterprises should check other lending agencies first before applying for Section 5 loans through the local electric co-op.

Ellis asked what rural co-ops can do, in answer to a forthcoming formal call from the federal government, to sponsor, assist, and encourage the development of co-operatives in other countries, especially Latin America. "We must begin at home," Hausler answered, "to build national support for our cooperative movement. It is important to show what the creation of rural jobs will mean to the cities and the rest of the country. Our rural areas must be showcases," he added.

PR Experts Needed

In another panel discussion, A. D. Mueller, general manager, Indiana Statewide Rural Electric Co-op, warned that co-ops "no longer can do public relations on a hit-and-miss, counter-attack basis." Public relations, he said, must be adequately financed, organized, policy-approved and expertly done.

Maurice Wieting, Ohio Farm Bureau Federation, told his audience that "we need to develop a new image for cooperatives, both for our members and the general public." Wieting also said, "Let's take the word 'enterprise.' We need to let more people know that cooperative enterprise is free enterprise at its best."

The third member of the rural electrification panel, Edward R. Slebiska, manager, Wright-Hennepin Co-op Electric Assn, said there is "an acute need for a central laboratory to house facilities to conduct research into farm electrification." This laboratory would study the effects of both visible and non-visible forms of radiation on plants, animals and insects; the application of the heat pump and supplementary solar heat for rural heating and cooling; the use of electronic controls for farm equipment to reduce labor; the establishment of motor specifications for new farm equipment; and the hazards of electric shock and burns. A federal research laboratory is needed to carry out these many projects, Slebiska emphasized.

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Experienced in statistical analysis and depreciation studies. Qualified to testify before regulatory agencies. Masters degree in Mathematics and knowledge of Accounting desirable.

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Please send resume including your salary requirements to address listed below. All replies will be held in strict confidence.

P-7113, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

RELAY TECHNICIAN
FOREIGN EMPLOYMENT
Major oil company with operations in the Middle East has opportunity for relay technician. Must be high school graduate with minimum 5 years experience adjusting, testing, and maintaining 66, 13.8, and 2.4 KV switch gear, including approximately 1000 items such as oil and air circuit breakers, protective relays, meters, regulators, transformers, and controls.

Modern and pleasant family living facilities, excellent schools, interesting travel and savings opportunities, plus all inclusive benefits. Write outlining personal history and work experience. Please include telephone number.

P-7184, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y., 36, N.Y.

INDUSTRIAL POWER SALES ENGINEER
Industrial Power Sales Engineer needed by Florida utility. Related experience with a utility or manufacturer preferred. Must be graduate engineer under 35 years of age. Excellent opportunity for advancement. Please send complete resume and salary requirements.

P-7409, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

ASSISTANT SALES MANAGER
Rigid Aluminum Conduit and related products. Unusual opportunity for seasoned sales executive with college education. Practical experience with electrical contractors and jobbers prerequisite. Requires some travel. All qualified applicants will receive consideration for employment without regard to race, creed, color or national origin.
Send resume to: **HARVEY ALUMINUM**
Attn.: John Frankel
19200 So. Western Ave., Torrance, California

Religious Signboards Repeated in Memory of Flanagan

The first inspirational message to appear on Florida Power Corp's big signboard in St. Petersburg ten years ago is currently being repeated in memory of J. K. "Pat" Flanagan, who originated the religious display series.

Flanagan, vice president of public relations who died June 2, conceived the idea of replacing commercial advertising with inspirational messages after he suffered a heart attack. This was his method of sharing his belief in prayer and expressing thanks for his recovery.

The unique signboard carries no advertising, not even the company's name. Florida Power Corp plans to continue the inspirational series in the future.

Qattara Depression Project Studied

A report by a team of West German engineers on the feasibility of the Qattara Depression hydroelectric project has been submitted to the United Arab Republic. The engineers estimate that power from the scheme could be delivered in Cairo for around 6¢ per kwhr, somewhat higher than that from the high dam at Aswan.

The Qattara scheme is to let water from the Mediterranean into a huge depression in the desert and to utilize the 440-ft difference in head between sea level and the depression for power generation. Evaporation would keep the head constant. Site is near the World War II battlefield of El Alamein.

Planning for the project will continue, as the UAR expects to need even more power than that supplied by Aswan. However, the Aswan project will have priority in planning.

Black Hills, CPPD To Build 161-Kv Tie

Black Hills Power & Light Co and Consumers Public Power District have signed an agreement to build a 161-kv transmission line between Rapid City, S. Dak., and Chadron, Neb. Engineering and purchase of rights-of-way are nearing completion, and construction is scheduled to begin in 1962.

Initially the new transmission facilities will be operated at 115 kv. BHP&L will build a 90-mile line from Rapid City to the Nebraska Border, and CPPD will build a similar 15-mile line north from Chadron.

Beginning Sept. 1, 1963, BHP&L will purchase a portion of its system requirements from Consumers for two years, enough to justify installation of a larger unit on the Black Hills power system at a later date.

Thereafter joint planning of capacity additions will take place. With the construction of the line physical facilities will exist for expanded pooling arrangements in the area.

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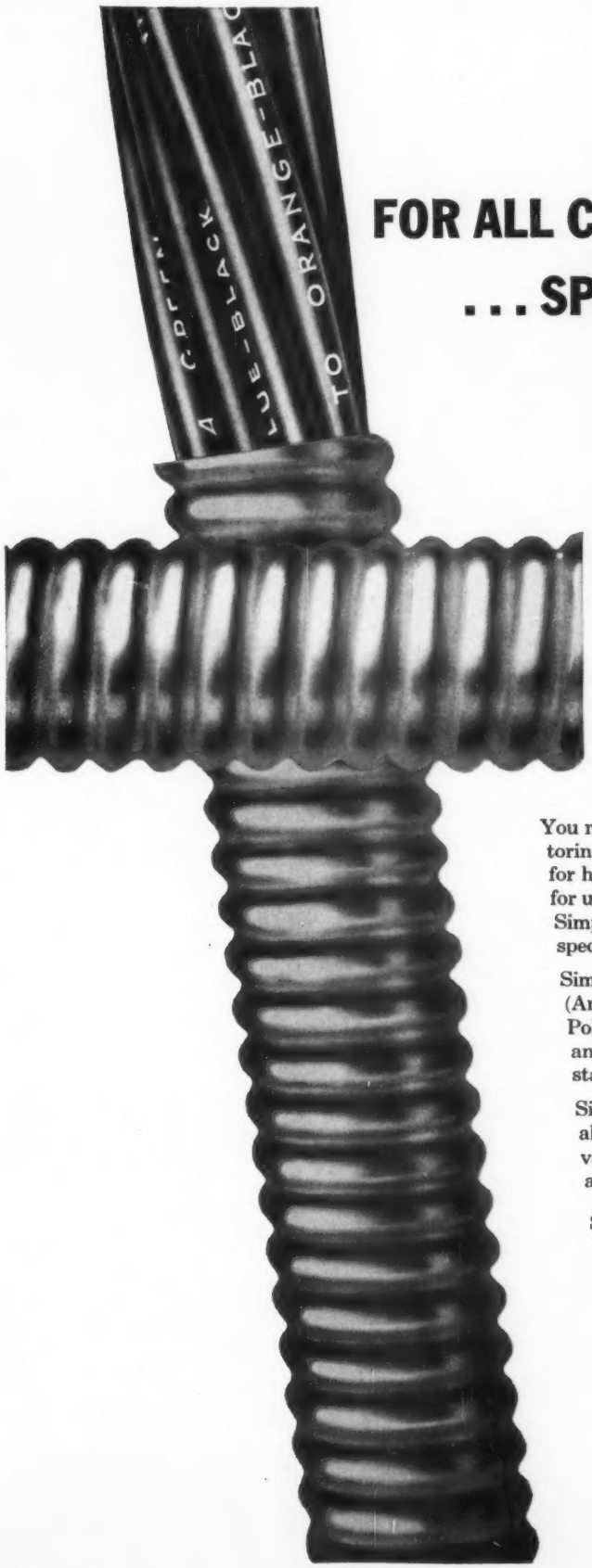

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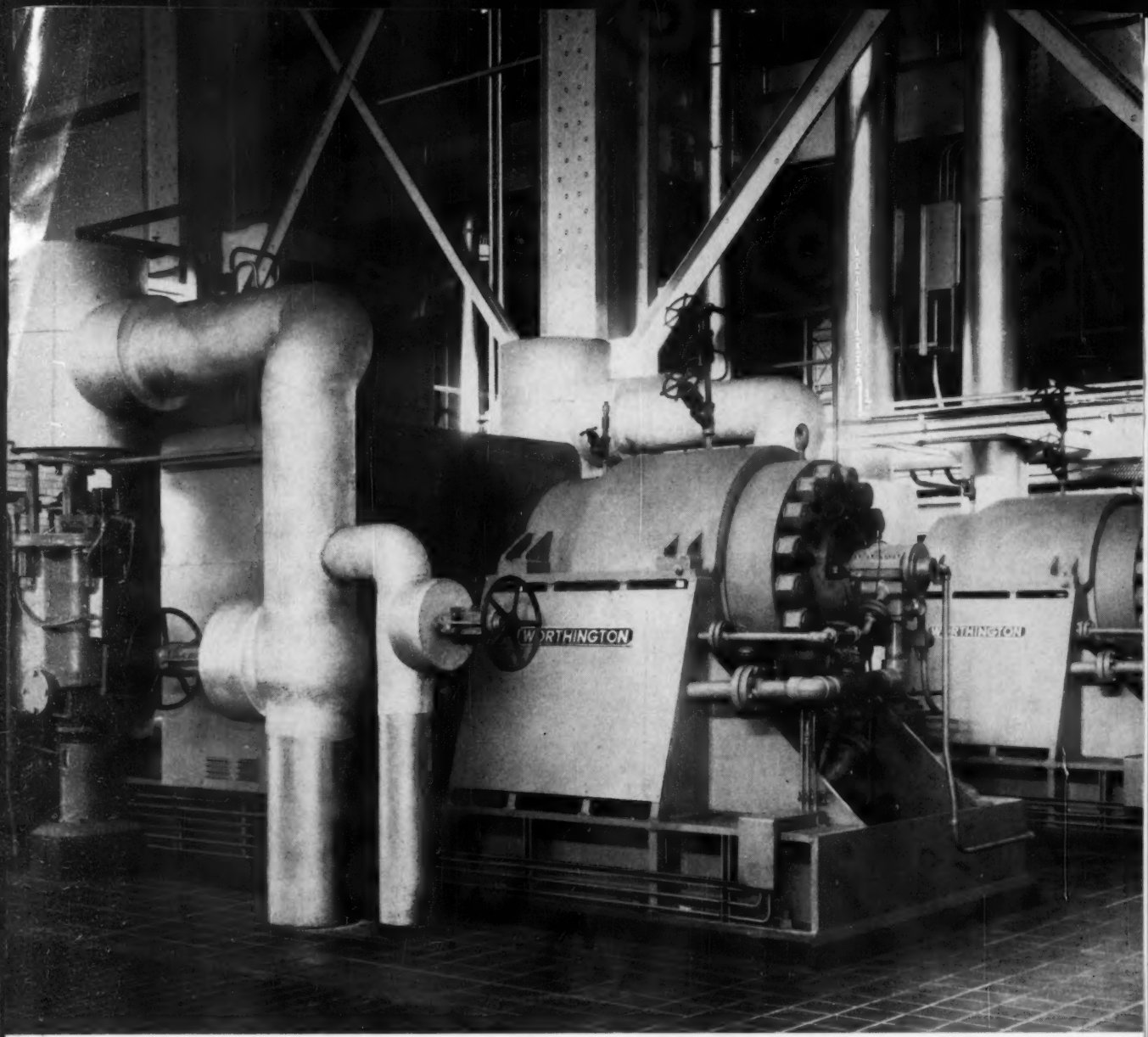

NEW PUMPS SET WORLD RECORD

Three Worthington high-speed boiler feed pumps have set a new world pumping record—developing a net pressure of 4514 psi in six stages within one casing. They constitute the first pump installation to develop the entire pressure required to feed a supercritical steam generator in one step.

They are located at Avon Unit No. 8, a 250,000 kw supercritical pressure steam generating unit of the Avon Plant of Cleveland Electrical Illuminating Company. The maximum turbine flow is 1,715,000 lbs. of steam per hour at 3500 psig.

The three pumps deliver 2285 gpm each at a total head of 11,580 feet. Two pumps are driven by steam turbines. The standby and start-up pump is motor-driven through a hydraulic coupling and a step-up gear.

In earlier supercritical pressure steam power plants, two or more boiler feed pumps operating in series have been used to build the total boiler feed pressure. But Cleveland Electric's studies disclosed that the higher cost of closed heaters designed for the full discharge pressure was compensated by the savings in pump and driver costs and the power savings of a one-step pumping system, such as they finally selected.

Should you select a one-step pumping system or a series system for your high-speed supercritical steam plant? Ask your Worthington representative for a complete installation report on the Avon Station Unit No. 8. And they will be happy to supply further information for your own studies. Or write Worthington Corporation, Harrison, New Jersey. In Canada, Worthington (Canada), Ltd., Brantford, Ontario.

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